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THE Journal OF THE
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# DECREASE IN CARIES FREQUENCY IN NORWEGIAN CHILDREN DURING WORLD WAR II

Guttorm Toverud, L.D.S., Ph.D., Oslo, Norway

During and after World War I a distinct reduction in caries among school children was observed in Norway, as well as in other countries touched by the conflict. This fact, though of great interest, was not paid due attention at the time.[1-3]

When World War II broke out, in September 1939, the Department of Pedodontia of the Dental School of Norway planned a comprehensive study of caries frequency among preschool and school children during the war. The study of school children was planned with the cooperation of public school dentists.

The aim was to obtain a fair representation of school children in the age group 7 to 14 years from the various parts of Norway. Unfortunately, soon after the plan had been put into practice, Norway was invaded by the Germans, and as a consequence many difficulties arose. Therefore, it was impossible to get exact dental records for more than 8,000 or 9,000 children in each of the years 1940 to 1947.

The dental examination was carried out by means of mirror and explorer; and the carious, filled and missing teeth (designated "D.M.F.") were recorded on a special chart designed for the purpose. During the first two years all teeth of each child were recorded. By 1942 it was observed that the caries distribution in the right and left quadrants of the mouth was nearly 100 per cent symmetrical. Consequently, only the right upper

Read at the annual session of the American Dental Association, August, 1947.

From the Department of Pedodontics, Dental School of Norway.

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1. Ramm, J.: Rjukan skoletannklinikk. *Den norske tannlaegeforenings tidende* 29:122, 1919.

2. Bensow, V.: Iakttagelser över kariesfrekvensen vid Göteborgs Folkskolers Tandklinik under kristiden. *Odontologisk tidskrift* 27:259, 1919.

3. Wheatley, J.: Prevention of Dental Caries, and the Desirability of Government Investigation. *Brit. D. J.* 41:753, 1920.

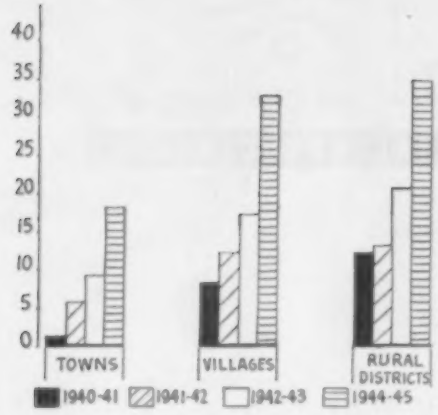


*Fig. 1.—Percentage of boys of tooth age 12 with caries-free teeth*

and the right lower arch were recorded in subsequent examinations.

In order to control to a certain extent the accuracy of the examination, one year's individual dental status of a child was compared with that of the previous year for the same child. Whenever disagreement appeared, the chart was returned to the dentist for re-examination.

The school children were grouped according to sex and age. The grouping in age was based on the number of erupted permanent teeth, designated "tooth age." The children were also divided into groups from towns, villages and rural districts, respectively.

The preschool children were divided only into age groups according to date of birth.

Because of difficulties encountered during and after the war, it has been impossible to include all data from this large project. These studies are to be continued for some years to come.

Therefore, in this short preliminary report only a few data will be given to demonstrate the average change in the caries frequency of school children as well as of preschool children during and after World War II.

## Results

***Figure 1.***—Figure 1, which includes boys of tooth age 12 (having the 8 permanent incisors and the 4 first permanent molars), demonstrates two interesting facts. A considerable difference is seen in the number of caries-free boys (not counting the temporary teeth) in the three groups: the lowest percentage occurred in towns and the highest percentage in rural districts. This difference was most pronounced during the first year of observation. The difference between the villages and the rural districts was very small

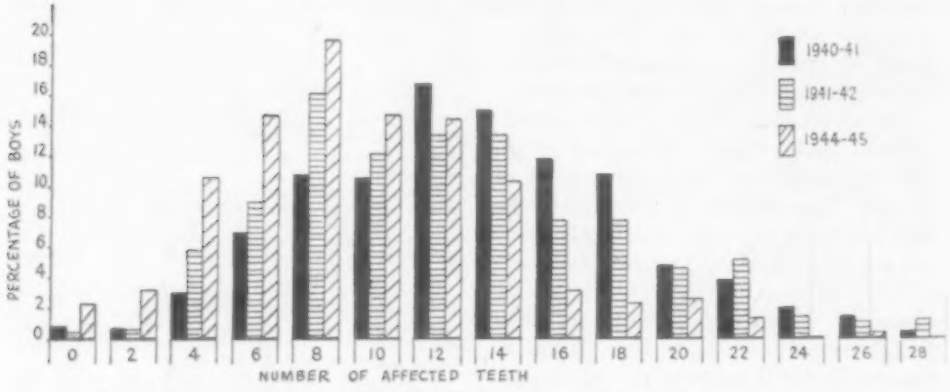


*Fig. 2.—Graph showing caries distribution in boys from villages. Tooth age 28*

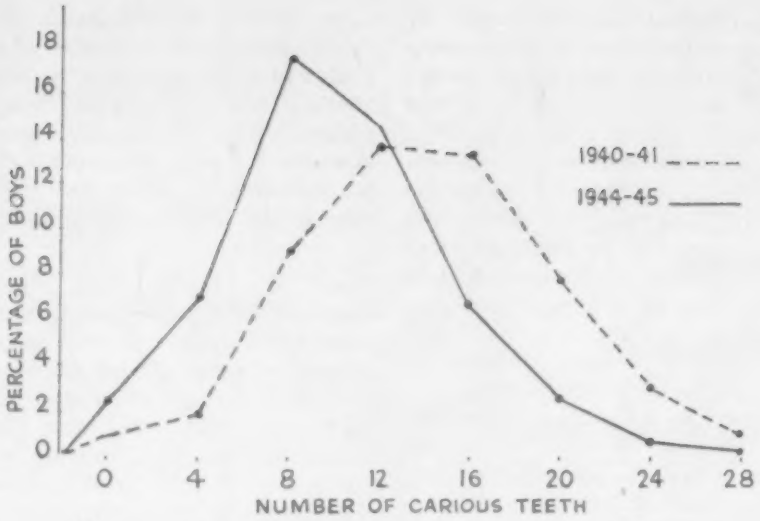


*Fig. 3.—Boys from villages, tooth age 28*

during the last four years of war, but the figures for the towns were considerably lower than the others for all the years observed. Another striking fact is that the percentage of caries-free children in all three groups increased considerably during the war. In towns the increase was from near zero when the war broke out in Norway to 17 per cent in the last year of war.

***Figure 2***.—Figure 2, comprising village boys with 28 permanent teeth, shows the percentage distribution of children according to the number of teeth affected. In order to get a clearer view, the years 1942-1943 and 1943-1944 are omitted. In 1940-1941 the peak of the curve is represented by the group having 12 carious teeth whereas the peak in 1944-1945 represents the group having 8 carious teeth. Furthermore, it was found that the percentage of children in the 6 carious teeth group during the last year was about the same as that of the 14 carious teeth group in 1940-1941.

***Figure 3***.—The changes in the caries distribution are more evident from the curves shown in Figure 3. This chart covers only the first and the last year of war. The gravity of the curve has been displaced toward zero.

***Figure 4***.—The data in Figures 1, 2 and 3 were taken from a group of school chil-

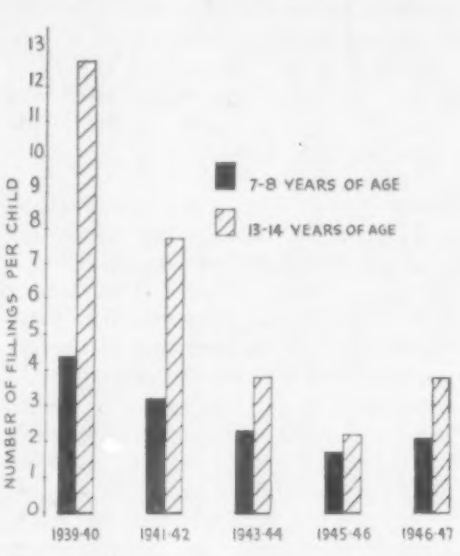


*Fig. 4.—Number of fillings in permanent teeth per child per year in the Fridalen Public School, Bergen, Norway*

dren from different places in Norway. In order to stress the extent of the decrease in caries frequency, with regard to the reparative work in the public dental school clinics, Figure 4 shows a survey from a public school in Bergen, the second largest city in Norway. During the school year 1939-1940, 4.4 fillings per child were inserted in the permanent teeth of children 7 to 8 years old and not more than 1.8 fillings in the year 1945-1946. In the 13 to 14 year old children the number of inserted fillings per child was 12.7 during the year 1939-1940 as compared to 2.3 during 1945-1946. During the year 1946-1947 a slightly smaller reduction was noticed.

As far as may be seen from the preliminary data, the average decrease in number of caries-affected teeth in Norwegian school children during World War II amounted to 35 to 50 per cent. Figuring the decrease from the number of D.M.F. surfaces it amounted to 60 to 75 per cent.

The number of preschool children examined was not as large as that of school children. Four small communities 15 to 30 miles from Oslo were chosen for the survey. About 600 children from 2½ to 7 years of age were examined in each of the years 1939, 1944, 1945, 1946 and 1947. In one community the dental examinations began in 1936.

*Figure 5.*—In two rural communities, Blaker and Fet, 60 to 80 per cent of the total number of children in the different age groups were examined. This number should give a fair representation. From Figure 5 it will be seen that in the age group 2½ to 3 years, the percentage of caries-affected children as well as carious teeth and tooth surfaces decreased during the war. For the year 1947, however, all the values raised again. In the age group of 4 to 5 years a similar but not as large decrease from 1939 to 1945 may be seen. In the age group 6 to 7 years no change took place in the percentage of caries-affected children, but a considerable decrease in the percentage of carious teeth and tooth surfaces is to be found. The age groups 3 to 4 and 5 to 6 are omitted from the graph. They show, however, the same pronounced decrease in caries-affected teeth and tooth surfaces as are demonstrated here.

*Figure 6.* — In a third community, Skedsmo, in the age group 6 to 7 years there was a distinct decrease in the percentage of caries-affected children, teeth and tooth surfaces from 1940 to 1945. In the age group 4 to 5 years there was almost the same high decrease in all respects as in the two other communities. The picture of the youngest age group, 2½ to 3 years, however, is different from that in the preceding chart. The same large decrease from the first year of war to the last year of war, as was demonstrated before, was not found. In the communities of Blaker and Fet, the percentage of caries-affected children dropped from 75 to 15, but in Skedsmo the percentage dropped from 43 to 15. The percentage of caries-affected teeth in the former decreased from 22 to 4 whereas in Skedsmo it was from 13 to 4.

It is possible to give an explanation for this difference. In the community of Skedsmo a health station for mother and child was started in 1936. The service at this station comprised the supervision of the general health of the mother during pregnancy and lactation, and of the child, and advice on nutrition and health education. Diet was emphasized. A liberal amount of milk, vegetables, cod liver oil and whole wheat bread and a decrease in sugar, sweets and other refined carbohydrates were recommended. No children more than the age of 1 year could be registered at the health station.

*Figure 7.*—Figure 7 will show the effect of this preventive health service on the teeth of the children. Dental conditions

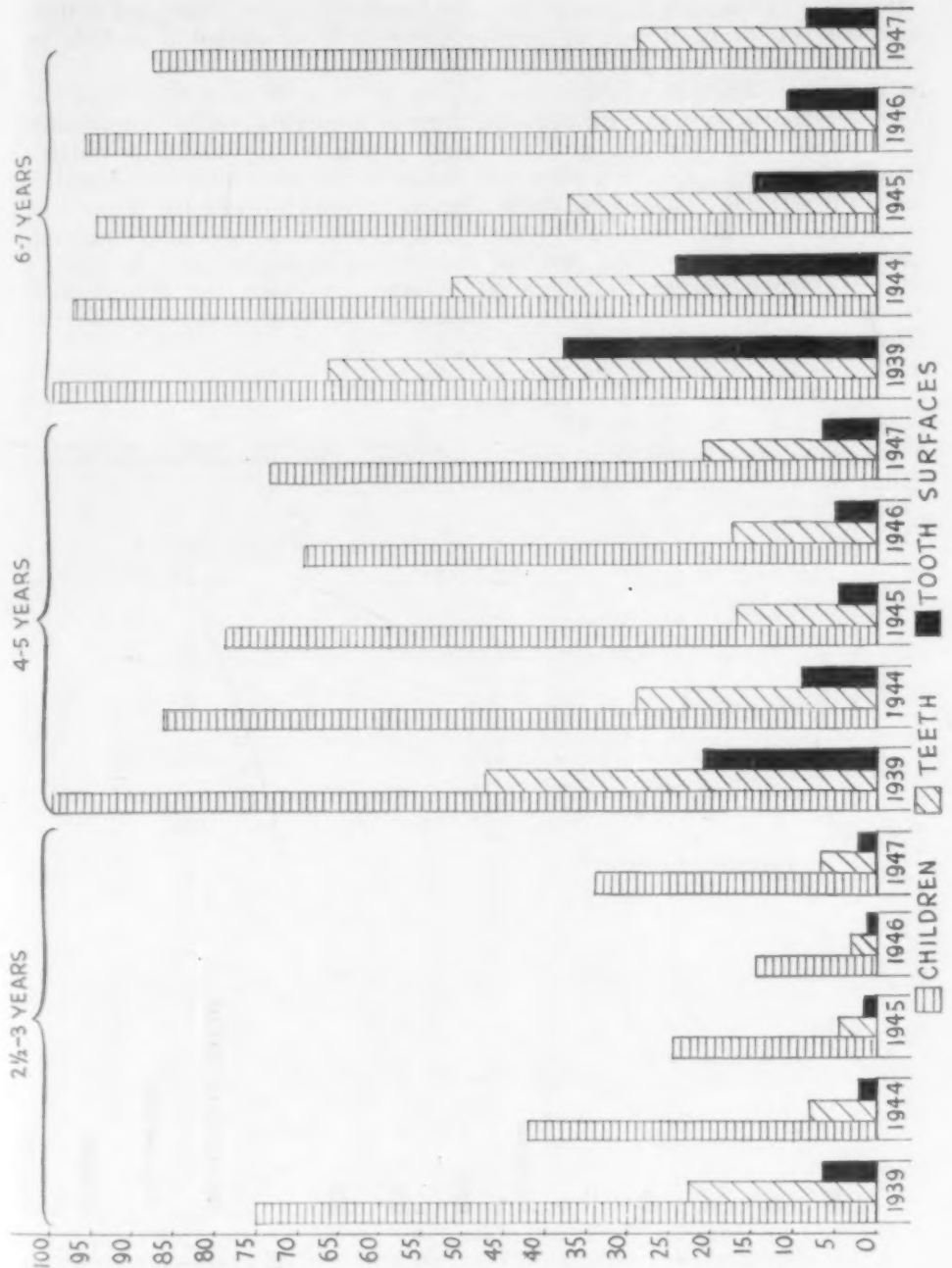


*Fig. 5.—Graph showing percentage of children, teeth and tooth surfaces showing caries of different age groups from rural areas of Blaker and Fet*

in 1936 and 1937 were the same, so these two years have been combined.

In the age group 2½ to 3 years the percentage of caries-affected children, teeth and tooth surfaces decreased during 1938, 1939 and 1940. Children from the health station were first included in 1938. All the differences are significant.

In the age group of 3 to 4 years no significant difference was found in the percentage of D.M.F. teeth before the year 1939. This year was the first one covering children benefited by the health station.

In the age group 4 to 5 years a "probably significant" decrease in the rate of carious, filled and missing teeth may be found in 1940. This was the first year dental examination in this age group included children from the health station.

*Figure 8.*—A greater reduction in caries frequency as a consequence of a preventive health service for mother and child in Norway is demonstrated from Oslo by K. Utheim Toverud[4] (Fig. 8).

As far as preliminary data show, the decrease during the war in carious, filled and missing deciduous teeth in children from 2½ to 7 years of age amounted to 40 to 60 per cent, and the decrease in D.M.F. surfaces was 60 to 80 per cent, the highest in the youngest children.

Today no exact data are at hand showing the change in the caries curve in

4. Toverud, K. Utheim, Beretning om de første 6 års arbeid ved Oslo kommunes helsestajon for mor og barn paa Sagene. *Fabritius og Sönner Oslo*, 1946 (English summary).

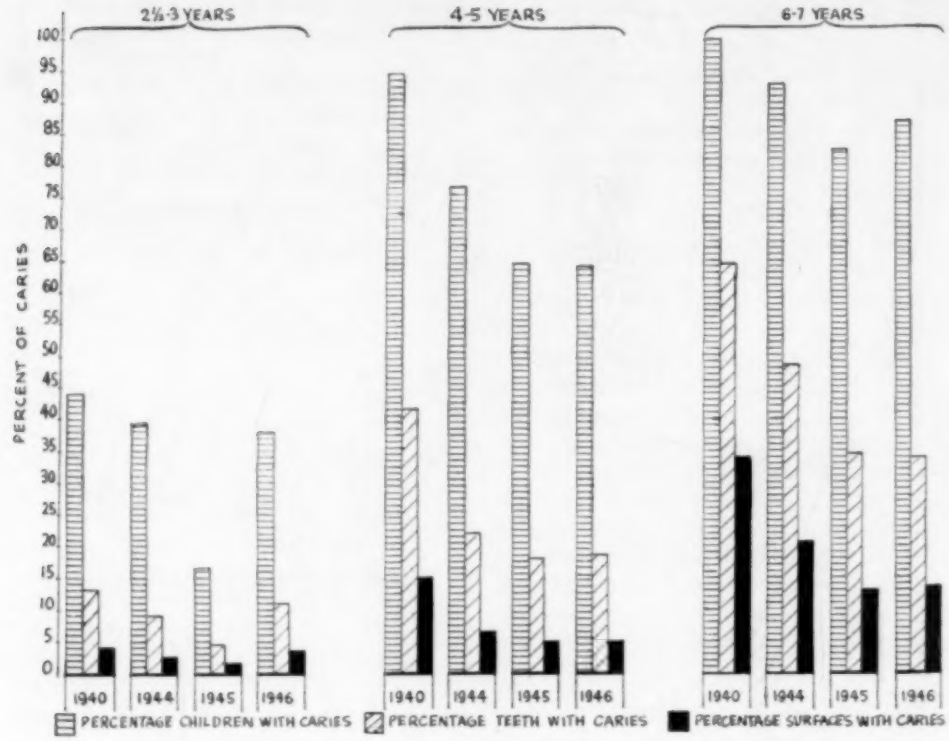


*Fig. 6.—Graph showing the percentage of children, teeth and tooth surfaces showing caries from Skedsmo*

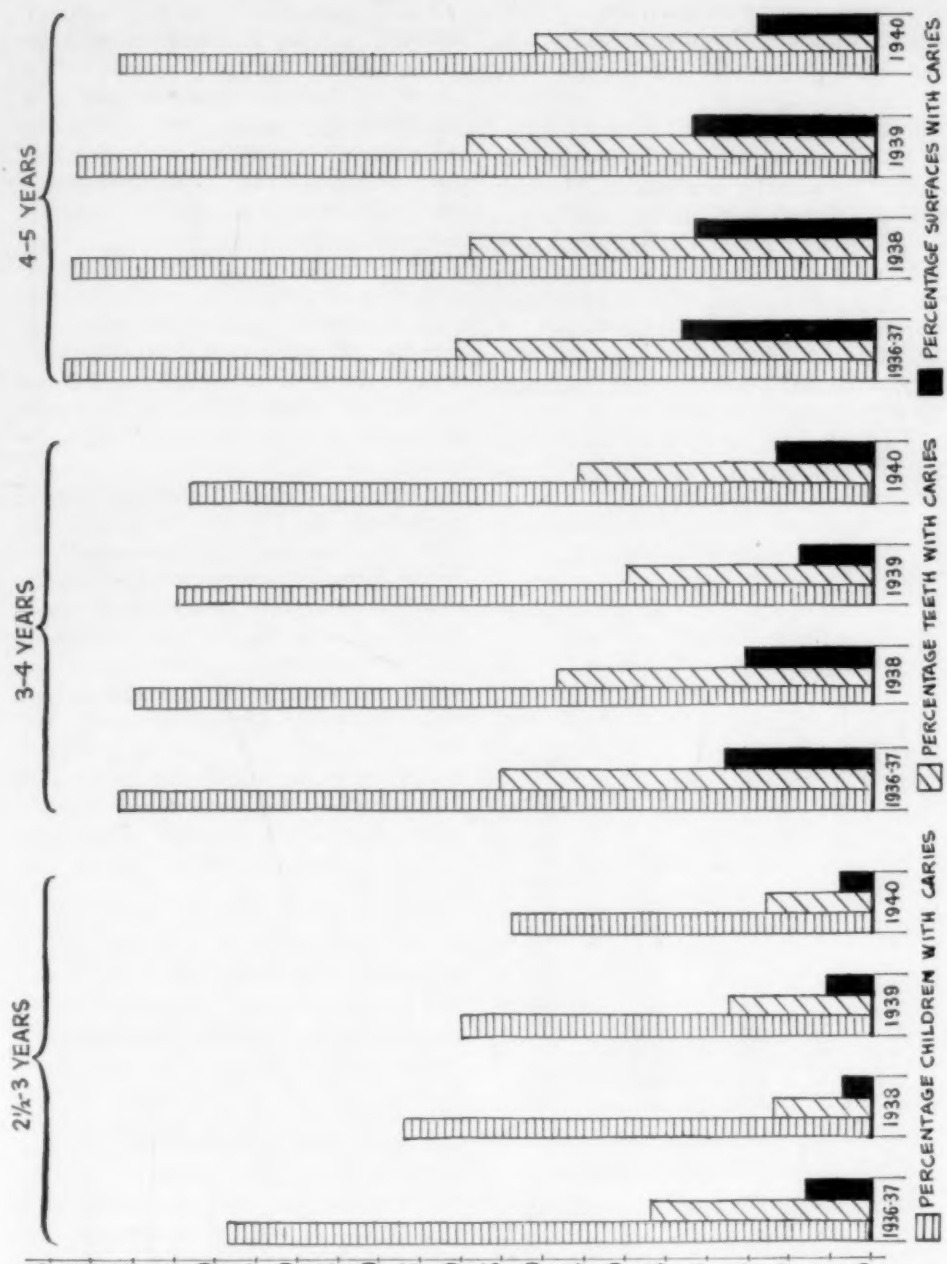


*Fig. 7.—Percentage of children, teeth and tooth surfaces showing caries in Skedsmo. Note the decrease in caries as a result of preventive health service in this community before the war*

the age group 14 to 18 years. But from preliminary communications it is justifiable to state that a great reduction also has taken place in this age group.

### Change in Diet

I will not try to analyze the various factors influencing this change. A short review of the main differences in the food consumption and food habits during the war, compared with those before the war, will explain this remarkable improvement in the dental health of children throughout the country.

Almost every kind of food was rationed during the war.

The pregnant and lactating women and the children up to 6 years of age were allotted 750 cc. of whole milk per day. Children from 6 to 16 years were allotted 500 cc. of whole milk. From 16 to 18 years the ration was 250 cc. of whole milk and 250 cc. of skimmed milk. To those 18 years and older the ration was 250 cc. of skimmed milk. For long periods the two last mentioned groups were without their daily ration. No cream could be bought.

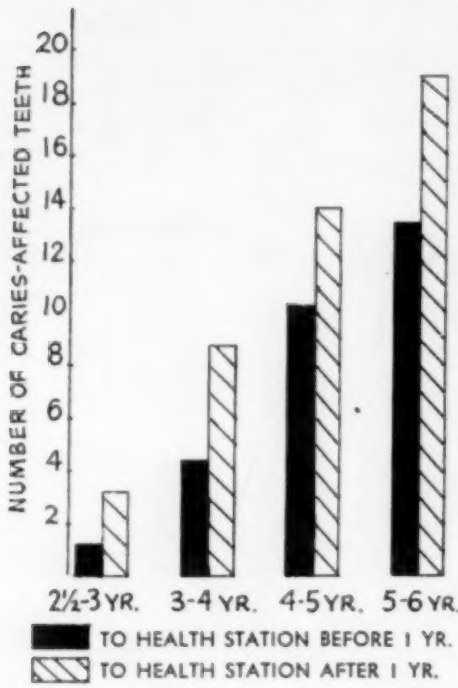


*Fig. 8.—Number of carious teeth per child at the Sagene health station for mother and child in Oslo. There were 1,572 children entering the station before 1 year of age, and 676 entering the station after 1 year of age. The difference in all age groups is statistically significant*

The ration of butter and margarine was very low—30 Gm. per day from 1941. Cheese was seldom available.

The milk producers were allotted a higher ration of milk, and the farmers used more milk, butter and probably more cheese than they did before the war.

Meat was seldom distributed to nonproducers.

Cod liver oil was rationed most of the time. The young children and the pregnant and lactating women were given preference. Pregnant and lactating women and preschool children used a liberal amount of milk and cod liver oil more regularly during the war than before the war.

The grain was milled to a 95 per cent flour (before the war usually 67 per cent), and from the middle of the war, 0.4 per cent calcium carbonate was added to it.

The ration of potatoes, roots and vegetables was high, and the consumption of these foodstuffs as well as of fish and salt herring was much higher than before the war. This was especially true among nonfarmers.

Sugar was rationed as early as September 1939—at first to 50 Gm. per day and one year later to 30 Gm. per day. With the yearly extra ration of sugar for canning, the daily amount was about 37 Gm. Before the war the consumption was approximately 90 Gm. Besides the low sugar ration, sugar cakes, puddings and different kinds of sweets were scarce. During the two last years of war no candy could be bought.

The variety of foods was small from day to day, and there was no chance for luxurious consumption.

Between-meal eating of refined carbohydrates and sweets was limited. The intake of vitamins A and D as well as of phosphorus and calcium should have been sufficient during fetal life, infancy and preschool age but, except for phosphorus, probably was too low during the later school age. The intake of vitamins B and C during pregnancy seemed to be low but probably was sufficient for the other periods. The amount of iron was too low in all periods.

The nutritional condition for the primary calcification of both the temporary and the permanent teeth, and for the secondary calcification of the temporary teeth, was fairly good. The nutritional condition for the secondary calcification of the permanent teeth after 10 to 12 years of age probably was worse than before the war. This is in agreement with the fact that the school children did not gain so much height and weight as they did before the war.

The most striking difference in the food consumption and food habits as a whole in age groups up to 14 to 15 years during the war compared with that before the war is as follows: omission of fine and white flour; high reduction in sugar and sweets; increased consumption of fish and salted herring; increased consumption of potatoes and vegetables; reduced intake of fruits; reduced intake of meat; reduced between-meal eating.

An increase in caries frequency was noticed during 1946 and 1947, and it seemed the youngest teeth (posteruptive age) reacted first. This was to be expected. The dietary condition in Norway gradually is returning to what it was before the war.

The caries frequency also has decreased in the three other Scandinavian countries. The highest decrease is found in Finland,[5] followed by Norway and Denmark,[6] and the lowest reduction is in Sweden.[7] The change in food consumption is in the same order compared with that before the war. The access to protective food has been least in Finland and best in Sweden, but on the other hand the reduction in sugar, sweets and other refined carbohydrates has been greatest in Finland and least in Sweden. These different conditions in the four Scandinavian countries are of great interest, and a Scandinavian committee composed of three members from each country has been appointed to study in detail the difference in caries frequency and the difference in diet and food habits in those four countries during World War II.

A low caries incidence during or after the war also has been reported from other countries, for instance from England by Mellanby and Coumoulos,[8] from Italy by Massler and Schour[9] and from France by Dechaume.[10]

In connection with the decreased caries rate and the change in diet during the war, it is of interest to compare reports on the low caries figures among the population in the isolated valley of Valle in Norway by Höye[11] and Toverud[12] and on the arrest of caries and the low incidence of new caries in controlled diabetic children in Norway reported by

5. Wilska, A., En fysiologs syn paa kariesproblemet. *Odontologisk tidskr.* 54:296, 1946.

6. Krohn, C., and Pedersen, P. O., Decrease in the Incidence of Dental Caries in 6-7 Year Old Copenhagen Elementary School Children 1936/43. *Tandlaegebladet* 42:127, 1944, *Acta Odontol. Scand.* 6:129, 1945.

7. Sneidern, V., Karies Frekvensen och kristiden. *Svenska Tandläkareförbunds Tidn.* 36:1, 1944.

8. Mellanby, M., and Coumoulos, H., The Improved Dentition of 5-year-old London School Children. Comparison between 1943 and 1929. *Brit. M. J.* 1:837 (June) 1944.

9. Schour, I., and Massler, M., Dental Caries Experience in Postwar Italy (1945); Prevalence in Various Age Groups. *J.A.D.A.* 35:1 (July 1) 1947.

10. Dechaume, M., Conception de la Carie dentaire. *L'Odontologie* 84:53, 1946.

11. Höye, G., Ernährungs-und Gesundheitsverhältnisse in Valle, Setesdal, Norwegen. *Den norske tannlaegeforenings tidende* 48:366 (Mar.) 1938.

12. Toverud, G., Zahnuntersuchungen in Valle, Setesdal, Norwegen. *Den norske tannlaegeforenings tidende* 48:395 (Mar.) 1938.

K. Utheim Toverud, Kjösnes and G. Toverud.[13]

## Summary

1. During World War II there has been noted a reduction of 35 to 60 per cent in D.M.F. teeth and of 60 to 80 per cent in D.M.F. surfaces in Norwegian children 2½ to 14 years of age.

2. During the same period there was a great reduction in the consumption of refined carbohydrates and an increased consumption of natural foodstuffs.

3. From the preliminary studies it seems the decrease in caries frequency during World War II can be attributed to an increased resistance of the teeth and a decrease in the environmental factors.

13. Toverud, K. Utheim: Kjösnes, Ellen, and Toverud, G., Undersökelser over kariesfrekvensen hos diabetikere i vekstalderen. *Odontologisk tidskr.* 50:509, 1942.

# STOP, LOOK AND LISTEN!

By Harlan H. Horner, Pd.D., LL.D., Albany, N. Y.

SEVENTEEN years ago, the Commission on Medical Education in its final report made this significant statement:[1]

> More advance has been made in scientific knowledge in the last sixty years than during the preceding twenty centuries.

The advances in scientific knowledge made by the medical and dental professions during the last 17 years in the prevention and treatment of human ills strongly confirm the observations of the commission. Side by side with this remarkable progress, the conviction of society has steadily developed that all we know and can do in the care of the sick is the birthright of all the people. Humane considerations alone prompt the growing belief that every human being, regardless of his social and economic status, should have the full benefit of the science and the art that have been developed in medicine and dentistry.

Unfortunately, economic conditions make it impossible for large numbers of our people to provide adequate medical and dental care for themselves. Under the circumstances an enlightened society reaches the conclusion that it must somehow come to their relief. There is no longer any debate upon the fundamental issue of the obligation of society in the premises. The only question turns upon how this care shall be brought to all who need it and, in our modern civilization, are humanely entitled to it. There are those who urge that the only satisfactory answer to this issue is the establishment of a system of national compulsory health insurance. There are others, equally concerned, who look with apprehension upon the governmental regimentation of physicians and dentists and gravely fear that shuttlecock, assembly line treatment will result from such a procedure.

The medical and dental professions in America are overwhelmingly opposed to

Former secretary of the Council on Dental Education of the American Dental Association.

1. *Commission on Medical Education. Final Report.* New York: Office of the Director of Study, 1932, p. 27.

compulsory health insurance as advocated by the present administration in Washington. The good faith of these professions and their honest and earnest desire to see adequate modern medical and dental care brought to all the people can hardly be questioned. Their zeal over the years in the prevention of disease and in the care of the sick, and the large measure of their unselfish devotion to humanity, stand indelibly in the record.

The office-holding advocates of universal, compulsory health insurance, however worthy their motives, have given scant consideration to the education, experience, feeling, service and judgment of those most vitally concerned in this tremendous issue, both as professional experts and as unquestioned public servants. The principal witnesses in a great human cause have not been called impartially by officialdom into the open court of public opinion; on the other hand, their motives, their good faith, and even their accomplishments, have been questioned by certain officeholders in Washington.

The medical and dental professions have thus far been remarkably patient and polite as paid agencies of the government have politically advocated the disposition of their destinies. They have even seemed hesitant to demand the consideration and recognition which their services to the public warrant, perhaps because they believe that the pursuit of science and the practice of an art should not become entangled with bureaucracy. The issue calls for plainer speaking than has hitherto prevailed. There are certain basic truths, which not even the proponents of universal bureaucratic health services have the temerity to deny, which need to be repeated.

### Medical and Dental Education

In our day the center of medical education, medical research, medical licensure and medical practice has moved from Europe to America. No informed person, disposed to candor, now denies that fact. Dental education, dental research, dental licensure and dental practice, in their leading forms as known today, were largely our own creations. There has never been any other center in the dental field comparable to our own. Physicians and dentists, possessing genuine professional instincts, are reluctant to voice in their own behalf the plain indisputable facts about the history and accomplishments of their professions in this country. Education, research, licensure and practice in medicine and dentistry have followed parallel and comparable lines with us for more than a hundred years. These professions, it should be emphasized, have been mainly responsible for their own development, progress and service to the public.

Through a gradual process of evolution a complete transformation has taken place from within in medical and dental education. This process has been initiated, fostered and developed primarily by the professions. The haphazard days of apprenticeship as the only means of training are long since past. The numerous professional schools set up by their owners as frank and brazen business enterprises have disappeared. To the everlasting credit of the professions, there is no longer a proprietary medical or dental school anywhere in America. It is universally recognized that the days of money making in the conduct of medical and dental education are gone forever. Moreover, there is no longer a medical or dental school in the United States which does not meet the minimum standards prescribed by the Council on Medical Education and Hospitals of the American Medical Association or the Council on Dental Education of the American Dental Association.

The full import of this significant fact is not clearly understood by the general public and certainly not by current agencies in Washington. Medical and dental educations, through the overt activities of

physicians and dentists themselves, have moved from their apprenticeship, proprietary and detached forms to the level of university disciplines. Sixty-one of our 70 approved four-year medical schools are university institutions, and all of the seven two-year courses in the basic sciences are located in universities. The nine approved medical schools in the United States not owned, controlled and directed by universities are patterned after the university schools in their curriculums, research and teaching. Thirty-eight of our 41 dental schools are integral units in universities, and the three detached schools are organized and conducted on the university level. Medicine and dentistry lead the professions in this country in the high, common, basically uniform standing of their training institutions. The accomplishments of medical and dental schools still vary widely between the best and the poorest, but the schools all subscribe to common goals in the scope and content of their pre-professional requirements and of their professional courses. The top leads the world and the bottom is educationally respectable.

It cannot be repeated too often that medical and dental professions are primarily responsible themselves for the high common level of their educational requirements. Nowhere in the United States may the beginner hope to qualify for practice in either profession without at least two years of credit in an approved college of liberal arts and without the completion of a recognized four-year professional course. In medicine, the prescribed minimum pre-professional requirement is far exceeded by the great majority of students, the prevailing credential offered for admission to medical study being a bachelor's degree. It is the universal practice, statutory in some states, for the medical graduate to spend at least a year after graduation in a hospital internship. In dentistry, more than half of the entering students offer from three to four years of liberal arts as credit for admission to dental study, and more than one-fourth offer a bachelor's degree. More and more dental graduates are seeking hospital internships to widen their experience before beginning independent practice.

The high levels of scholarship demanded, the material rewards assured and the opportunities for service to mankind promised by a professional career now attract many more applicants of high intellectual caliber and force of character than the medical and dental schools can accommodate. One can only gravely anticipate what the situation will be if and when physicians and dentists are reduced to the level of civil service employees in a bureau of the government. What type of youth will seek admission to a profession where he is doomed to march in lock step and spend an unconscionable amount of time day by day recording *what, why and how much he did for such and such at so much* for the inspection and criticism of some bureaucratic satrap and for burial in a dozen different files in accordance with the unintelligible rules and regulations which only government is able to devise.

Research and opportunities for advanced study are also the result of zeal exhibited within the professions. Refresher, postgraduate and graduate courses are broadened and extended each year. The demand of both physicians and dentists for opportunities for improvement in service and for formal advanced study is universal and in continued excess of the facilities available. Research is inseparably associated with teaching in the professional schools. The demonstrated discovery and proof of a new remedy or method of treatment is at once given to the world without commercialization.

The licensing provisions for physicians and dentists in all the states are closely correlated with the basic educational requirements. The general public is not always aware that the professional stat-

utes throughout the country are based fundamentally upon the right and duty of the state to protect its citizens against incompetency and unfitness of individual practitioners of the healing art and not, as is sometimes erroneously assumed, to create a monopoly of professional practice. In every case what constitutes the practice of medicine and of dentistry is clearly defined, penalties are imposed for malpractice and illegal practice and standards of character and of moral and professional conduct are prescribed. Mainly, these universal requirements and standards have been developed over the years and written into law through the initiative and leadership of the professions.

Beyond the formal and universal prescriptions of law, however, the medical and dental professions in the United States through their local, state and national associations have formulated and succeeded admirably in securing the observance of standards of professional conduct. The Hippocratic oath to which all medical graduates subscribe is not a mere counsel of perfection but a solemn obligation of professional behavior to which the vast majority of physicians subscribe throughout their lives. Both medicine and dentistry have widely publicized codes of ethics which are enforced without fear or favor against the practitioner who in his practice offends the tenets of conduct prescribed by his fellows.

The sum total of the development of medicine and dentistry in our free society on an unregimented basis over the last hundred years has given us a leadership in the healing art, based on continued scientific research, throughout the world. This is not an idle declaration. It is a universally acknowledged fact. Even a cursory enumeration of some of the advances in the first half of the twentieth century will give some measure of the progress.

Diphtheria, typhoid fever, yellow fever, bubonic plague and smallpox are preventable diseases today. Their outbreak in any region is proof that health authorities have failed in the administration of known means of prevention. Tremendous advance has also been made in their control and treatment, once they do break out. Tuberculosis and syphilis gradually come under control. Heart ailments and cancer are under intensive promising study. The treatment of diabetes with insulin, of pernicious anemia with liver therapy and of certain mental disturbances by the shock process has prolonged the useful life and added to the personal comfort of thousands of sufferers. The effectiveness of surgery has been broadened by the use of newly developed anesthetics, and the surgery of the nerves, the heart and the lungs has opened wide new fields for the maintenance of health. The advance in obstetrics is shown by the constantly decreasing death rate of both mothers and children. The discovery and culture of the viruses have aided the treatment of influenza, pneumonia, encephalitis, mumps, measles and poliomyelitis. Chemotherapy with the resulting penicillin, streptomycin and the entire group of sulfonamide drugs has revolutionized the treatment of many diseases.

Dr. Louis I. Dublin, second vice president and statistician of the Metropolitan Life Insurance Company, a leading authority in vital statistics has said:[2]

> It is not an exaggeration to claim that the current prosperity and leadership of the United States in world affairs flow in good part from the achievements of the last century in the field of medicine and in its auxiliary services.

Dr. Dublin has also pointed out that in the last hundred years the life expectancy of males has increased more than 25 years and of females more than 28 years. He estimates that the average length of life in this country will be 68.4

2. Dublin, Louis I., A Centennial of Public Health. *Am. J. Pub. Health* 38:1635 (Dec.) 1948.

years by 1960 and 71.4 years by 1975.

Dental educators and dental practitioners have long since learned that the diseases of the oral cavity are inseparably associated with the diseases of the entire body. Modern dental practice begins with inquiry into the causes of the malady as revealed by the general systemic condition of the patient. Prevention rather than restoration is the keynote of dentistry of the future. Prenatal and early child care give great promise. Progress is being made in trailing down the causes of dental caries, and steps are being taken to eliminate those causes. The necessary restorative processes employed by American dentists are nowhere rivaled. Here again, the advances in this field of health service are based upon scientific inquiry and procedure, and are in the hands of a happily unified profession. Dentistry, more fortunate than medicine, is free from legalized cultists and quacks.

### Status of Existing Health Service

With all of these advances in evidence, no intelligent, informed person—certainly no one within the medical and dental professions—would be foolish enough to claim that the status of our existing health service is ideal or anywhere near satisfactory. Our vaunted American way of life will not have realized its destiny, nor its potentiality, until every human sufferer, regardless of his status, has the benefit of scientific treatment and care.

Physicians and dentists, while numerous enough in some areas to meet current demands, are not distributed geographically in the best interest of the health of all the people. Great numbers of our population go without adequate medical and dental care for want of the means to pay for it. Moreover, in many states legalized ignorance and incompetence in alleged treatment and care of the sick has gained alarming headway. With a medical science and its therapeutic application which leads the world in the maintenance and restoration of health, we have the strange situation of recognized quackery to which multitudes of our people resort and pay for treatment which is unscientific and professionally dishonest. It is not merely the uneducated and the credulous who seek out these incompetent practitioners, licensed or not licensed by the state; intelligent men and women in physical distress listen to old wives' tales, depart from the rationality which governs their lives in other particulars and accept treatment for real, imagined or alleged ills, the scientific soundness, the efficiency and even the professional honesty of which modern, enlightened medicine flatly denies.

Any overnight "pathy" of medicine can gain a following. It is indeed a sad commentary upon the common level of our intelligence when cultists and faddists, usually lacking education and innocent of scientific training, can go to our state legislatures and secure local recognition, commonly on the fatuous plea that they are engaged in practice of the healing art contrary to law. Surely, if we persist in claiming that we are an enlightened people, the day will come when no one will dare to set himself up as competent in the healing art who does not possess the background of education and training and who does not meet the licensing standards universally prevailing for the practice of modern medicine. One of the intellectual and social crimes of our generation is the ease with which second, third and fourth rate healers have gained recognition in many states and the insolence with which they engage in so-called practice in the states that have not surrendered to them.

It may be remarked in this connection that the proponents of compulsory health insurance on a national basis, if they should succeed in fastening their ill-advised plan upon the country, will be faced with the nasty issue of what to do with the thriving groups of incompetents who have been authorized by state gov-

ernments to practice some branch of the healing art. Will a benevolent government, anxious to do everything for everybody, tax the populace to pay for unscientific treatment carried on by uneducated quacks? And what will the government do in those states which have had the courage and the good sense to establish one standard, and one only, for all those who would treat the sick?

## National Health Assembly

The irony of the present situation is deplorable. The medical and dental professions have earned the right to be heard in any consideration of national health problems. Certainly their almost unanimous judgment that compulsory federal health insurance is not the answer should be taken into account. The government made a polite gesture in this direction in the National Health Assembly held in Washington May 1-4, 1948. This assembly called by the Federal Security Administrator brought together approximately 800 representatives of education and practice in medicine, dentistry, pharmacy and nursing, public health officials, hospital authorities and laymen from business, labor and other walks of life. The assembly was carefully planned and admirably conducted. Certain features of it, however, were palpably disingenuous. The Federal Security Administrator repeatedly announced that the assembly would deal with the health problems of the nation strictly apart from controversial issues.

President Truman addressed the second general session and frankly told the assembly where he stood and what he proposed to do on the issue of national health insurance. In a subsequent general session Dr. Morris Fishbein of the American Medical Association, properly assuming that all restrictions were off, vigorously took the opposite position. He was criticized and charged with lack of good sportsmanship by the management of the assembly.

It was common talk throughout the sessions that the Federal Security Administrator was busily engaged in finding evidence to support his predetermined and preannounced views on national health insurance. At the final session of the section on Professional Personnel, Mr. Ewing paid his respects to the medical and dental professions in terms that were uncomplimentary. He declared flatly that the great majority of physicians do not keep abreast of advances in medical research or up-to-date in the latest methods of practice, that few of them have a new thought five years after leaving college, and that in the interest of public health all physicians should be reexamined by state authorities at least once every five years. These are not his exact words but perhaps 75 persons attending the section meeting heard this responsible agent of the government make the comment.

The secretary of the Council on Medical Education and Hospitals of the American Medical Association was present at the meeting. He promptly produced evidence—well known to everyone in the meeting with the exception of Mr. Ewing—to show the zeal exhibited by physicians throughout the country to improve themselves in service, the number and range of special, postgraduate and graduate courses attended by physicians in medical schools, medical centers and hospitals and the numerous clinics, conferences and assemblies conducted by local and state associations under the auspices and with the encouragement of the American Medical Association.

The secretary of the Council on Dental Education of the American Dental Association was also present at this section meeting. He asked Mr. Ewing if he held the same views concerning dentistry which he had just expressed concerning medicine. Upon being answered by Mr. Ewing in the affirmative, the secretary produced evidence that the refresher, postgraduate and graduate courses in

dentistry throughout the country are filled constantly, that the clinics conducted by the local, state and national associations of dentists are always crowded and that state and national journals in dentistry, devoted to scientific advances and to methods of practice, regularly reach practically all of the dentists in the United States.

Mr. Ewing left the section meeting without further comment.

The full report of the deliberations and conclusions of the 14 section meetings in the assembly has not yet been published. On September 2, 1948, however, Mr. Ewing transmitted a 186 page report to President Truman on "The Nation's Health—A Ten Year Program." In this document he was obliged to say that the National Health Assembly had taken no action, one way or the other, on the question of national health insurance. In urging his own views, however, he leaned heavily upon the observations and recommendations of the section on Medical Care which gave him more encouragement than any of the other sections to go forward with the scheme upon which he was fully determined before the assembly was held. Many delegates to the assembly, genuinely interested in its announced objectives and in the high level of the discussions which took place and in the observations and recommendations of all the sections not yet given to the public, feel that they have been let down by the deliberate disingenuous use of the assembly by the Federal Security Administrator to bolster the government's plan to regiment the health professions.

Here we have one energetic and determined partisan with scant knowledge of the traditions, accomplishments and objectives of the medical and dental professions setting himself up as better able than they to judge the means and methods by which adequate medical and dental care should be provided for all the people. It is time to call a halt on mere political consideration of this vital issue. Its proper determination is vastly more important than the hasty passage of experimental legislation. We have examples of the socialization of medicine and dentistry in other parts of the world; namely, England, the Scandinavian countries, New Zealand and Australia. Their success or failure with the movement in the interest of the long-range health of their people may or may not be applicable to our situation. Why go ahead blindly, however, without exact knowledge of what is happening in these countries, both to the professions and to the people? Why not send a commission around the world to study this problem? Why let a Federal Security Administrator, a President and even a Congress determine what we shall do until we know better than we do today what ought to be done? Why not also give a fair and nonpolitical appraisal of the promising movements now under way, largely inspired by medicine and dentistry, to extend adequate health care to all our people? Why not Stop, Look and Listen!—*171 South Main Avenue.*

▲

***Longevity in Roman Egypt.*** —Longevity in Roman Egypt about 2,000 years ago was studied by Karl Pearson, the noted British mathematician, from the ages at death recorded on mummy cases. From these data he drew a curve of expectation of life according to age, which yielded a figure of about 22 years as the expectation at birth. While the ingenuity and enterprise of Pearson and other investigators of early records are to be commended, probably the only conclusion to be drawn with any degree of accuracy is that, in antiquity, the average length of life may have been somewhere between 20 and 30 years.—*"Longevity From Ancient to Modern Times," Statistical Bulletin, Metropolitan Life Insurance Company, October 1947.*

# A STUDY OF ODONTOGENIC EPITHELIUM IN THE DENTAL FOLLICLE

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THE purpose of this study was to examine microscopically the dental follicles of a large number of embedded teeth. The microscopic picture in each case was studied in relation to the roentgenographic and clinical data in that particular case, and an effort was made to determine whether a correlation existed between the microscopic picture and the roentgenographic appearance of the pericoronal (follicular) space. It was hoped that something might be learned about the origin and development of dentigerous cysts.

In the thesis of which this paper is an abridgment, a brief review of the essential embryologic characteristics of the teeth and surrounding structures and of the histologic picture of the follicle was given. The literature also was reviewed for the potentialities of odontogenic epithelium and for the origin and development of follicular (dentigerous) cysts.

Gettinger[1] published his observations on the relation of odontogenic epithelium to cystic and other diseases of the mouth and jaw. He made a study of the follicular sacs of unerupted teeth and endeavored to evaluate the "odontogenic epithelial residuum" in these sacs. One of the differences between his study and the present one was that he did not correlate the microscopic picture with the appearance of dental roentgenograms in each case, as we have done. In brief, some of his conclusions were as follows: The remnants of the enamel organs in the follicles of unerupted or partially erupted teeth occur most frequently as epitheliated follicular spaces, but isolated epithelial islands are almost as common. The epithelium of the follicular space most frequently lines the wall. It is usually composed of simple stratified squamous or polyhedral cells, but it occasionally presents cuboid or cylindric features. Proliferation of epithelium in the follicular space is related to moderate and severe inflammation and has only slight relation to the age or sex of the patient or to the location or type of the enamel organ remnant. Atrophy, even to the degree of complete disappearance of epithelium, is usually in inverse proportion to the degree of inflammation. It is often apparently spontaneous.

## Material and Methods

Material used in this study consisted of follicles or remnants of follicular tissue obtained incidentally in removal of embedded teeth (third molars, cuspids and bicuspids) at the Mayo Clinic. One hundred specimens, from 76 different patients, were studied. The number of specimens was greater than the number of patients because sometimes more than one tooth with associated follicular tissue was removed. Seventy-six specimens con-

Abridgment of thesis submitted by Dr. Conklin to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of Master of Science in Dental Surgery.

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1. Gettinger, Raymond, Relationship of Odontogenic Epithelium to Cystic and Other Diseases of Mouth and Jaw: The Follicular Sacs of Unerupted and Partially Erupted Teeth. *Arch. Clin. Oral Path.* 4:198 (Sept.-Dec.) 1940.

*Fig. 1.—Mandibular third molars illustrating classification on basis of width of pericoronal space. a: Group 1, 0.5 to 1.5 mm. b: Group 2, 1.5 to 2.5 mm. c: Group 3, 2.5 to 3.5 mm.*

sisted of follicle or follicular tissue alone; in 24 specimens there was still some attachment of the follicle to the tooth, and it was necessary to decalcify the specimen before preparation of the sections.

The average gross specimen of follicular tissue was grayish white and approximately 2 mm. thick, 3 mm. wide and 15 mm. long.

Dental roentgenograms of each patient were available and were used to determine whether a correlation existed between the microscopic picture of the dental follicles and roentgenographic appearance of the pericoronal (follicular) space. A clinical history also was available in each case studied.

From the dental roentgenogram and the clinical history it was possible to determine if the tooth from which the follicle was obtained had been embedded. The width of the pericoronal space as it appeared roentgenographically was determined, and cases were divided into three groups: group 1, in which width of the pericoronal space was 0.5 to 1.5 mm.; group 2, 1.5 to 2.5 mm., and group 3, 2.5 to 3.5 mm.

Of the 100 specimens, 59 were mandibular third molars, 33 were maxillary third molars, 4 were maxillary cuspids, 2 were mandibular bicuspids and 2 were mandibular cuspids. Ninety-two of the 100 specimens were completely embedded, and 8 were partially erupted.

Of the 76 patients from whom the 100 specimens were obtained, 17 (22 per cent) were men, and 59 (78 per cent) were women. The average age of patients was 23 years, the range being from 13 to 58 years. Sixty-four (84 per cent) of the 76 patients were 25 years of age or less.

Specimens were placed immediately, at the time of operation, in a fixing solution (5 per cent dilution of formaldehyde solution) and were allowed to remain an adequate time for proper fixation. The 76 specimens which consisted only of soft tissue follicle, having no tooth attached, were prepared for sectioning.

The 24 specimens in which the follicular tissue was attached to the tooth were put through a decalcification process after fixation, with the result that only the organic matrix of the tooth (dentin, cementum and pulp) and the soft tissue follicle remained. The degree of progress of decalcification was checked roentgeno-

*Fig. 2.—Section of decalcified tooth showing relation and attachment of follicle to tooth (×7)*

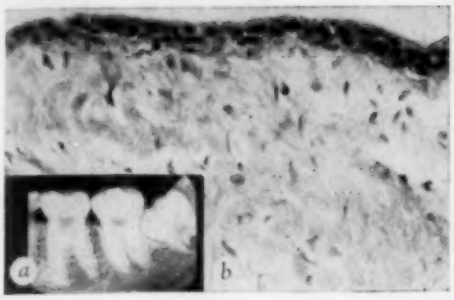

*Fig. 3.—a, Embedded mandibular third molar; b, squamous epithelium lining follicle (hematoxylin and eosin, ×350, reduced to about ×220)*

graphically. A method described by Lovestedt[2] was followed in general, but there were slight variations in minor details. During the process of decalcification roentgenograms were made at various intervals, and when a roentgenogram did not reveal calcified material, specimens were removed from the acid.

When decalcification was determined roentgenographically to be complete, specimens were washed in running water for 24 hours and then replaced in formaldehyde solution to await sectioning, staining and preparation of slides.

All specimens were embedded in paraffin, and serial sections were made. Sections numbered 1, 10 and 20 were mounted and stained with hematoxylin and eosin. Special stains were used on the intermediate sections when there was any doubt as to the type of tissue present or when it was desired to differentiate the tissues more accurately.

## Observations

***Roentgen Study.***—The dental roentgenograms were examined in order to determine both the true position of the tooth and the width of the pericoronal (follicular) space as it appeared roentgenographically.

Figure 1 illustrates the roentgenographic appearance in 3 of the cases in this study, *a* being typical of group 1, *b* of group 2, and *c* of group 3.

Figures 2 and 3 illustrate the roentgenographic and microscopic appearance in a case in which the follicle retained its attachment to the tooth.

***Microscopic Examination.*** — Microscopic study revealed the presence of epithelium as an outstanding characteristic in a large percentage of the follicles. This epithelium usually took the form of a lining (Figs. 3 to 5) or, almost as frequently, of isolated nests or cords of epithelial cells (Fig. 6) dispersed throughout the connective tissue of the follicle.

The lining epithelium of the specimens frequently showed simple stratified squamous cells (Fig. 3,*b*), but it was fairly common to observe cuboid or columnar (ameloblastic) epithelium (Fig. 5).

An incidental observation in the microscopic study of the 100 follicles was the presence in several instances of a loose, myxomatous type of connective tissue (Fig. 6). This tissue consisted of loosely woven spindle-shaped cells and stellate cells, which had long fibrillar

2. Lovestedt, S. A., Roentgenographic Method for Determination of Degree of Decalcification in Preparation of Tissues for Histologic Examination. *Am. J. Clin. Path.*, Tech. Supp. 6:89 (Nov.) 1942.

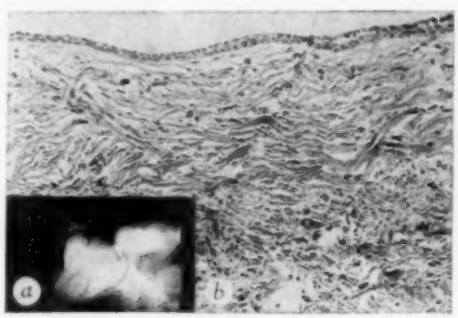

*Fig. 4.—a, Mandibular third molar; b, squamous epithelium lining follicle (hematoxylin and eosin, ×185, reduced to about ×117)*

processes and contained small ovoid nuclei.

Weinmann and Sicher[3] have pointed out that the myxoma resembles embryonic mucoid tissue, which may arise at any place in the mature body where loose connective tissue is stimulated to neoplastic proliferation. An increased similarity to embryonic mucoid tissue is caused by overproduction of an amorphous intercellular substance accompanied with failure of differentiation of collagenous fibers. They stated that mucoid degeneration of a fibroma or chondroma may result in a secondary myxoma; the mucoid-containing substance expands, and the fibers and fibrils apparently disappear. This degeneration may result in an end product with a histologic picture so similar to that of primary myxoma that differential diagnosis is impossible without a detailed history.

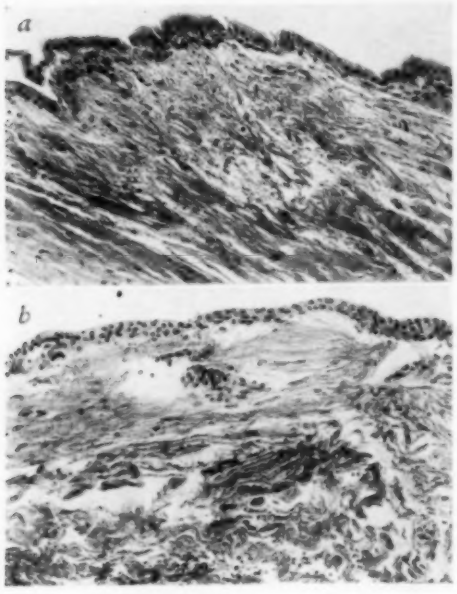


*Fig. 5.—Follicle of a, maxillary third molar, illustrating columnar type of epithelium lining follicle; b, mandibular third molar, illustrating cuboid type of epithelium lining follicle (hematoxylin and eosin ×170, reduced to about ×107)*

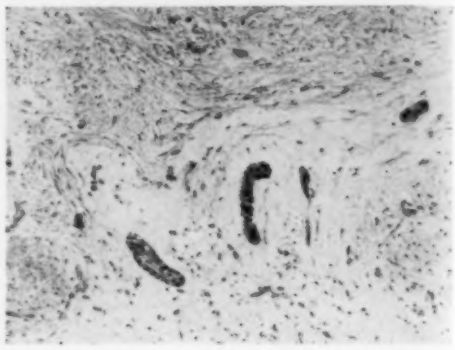

*Fig. 6.—Follicle of mandibular third molar, illustrating nests and cords of epithelial cells and loose myxomatous type of connective tissue (hematoxylin and eosin ×135, reduced to about ×81)*

Bell[4] stated that a myxoma is a tumor composed of mucoid tissue, which is a modified form of connective tissue, and that its cells are fibroblasts. This tissue is present in the umbilical cord, but normally is not found elsewhere. Bell pointed out that any connective tissue (bony, cartilaginous, adipose or fibrillar) may undergo metaplasia and become myxomatous, and that myxomatous portions are frequently seen in tumors derived from any connective tissue. He stated that myxomatous transformation of a tumor is to be interpreted as metaplasia rather than as degeneration. The cells are stellate or spindle shaped, with long processes and abundant intercellular substance containing mucin. Myxomas, Bell stated, occur usually in subcutaneous, subserous and intermuscular tissues.

***Statistical Data.***—The 100 follicles were divided into three groups on the basis of width of pericoronal space, as indicated by the roentgenographic appearance. The sections were examined microscopically

3. Weinmann, J. P., and Sicher, Harry, *Bone and Bones: Fundamentals of Bone Biology*. St. Louis: C. V. Mosby Company, 1947, p. 374.

4. Bell, E. T. (editor), *A Text-Book of Pathology*, ed. 6. Philadelphia: Lea & Febiger, 1947, p. 312.

for the presence of epithelium, either in the form of a lining or as isolated nests or cords of epithelial cells. The character of the connective tissue also was noted.

The statistical data are presented in the accompanying table. Of the 100 follicles, 70 showed an epithelial lining. Epithelium in one form or another, either as a lining or as isolated nests or cords, appeared in 86 of the 100 follicles. As the pericoronal space increased in width, the percentage of follicles showing an epithelial lining, as well as the percentage of follicles in which epithelium in some form was present, also increased.

Epithelium in both forms, as lining epithelium and as isolated nests or cords of epithelial cells, appeared in 51 of the 100 follicles. Twenty-nine (45 per cent) of the follicles in group 1, 17 (57 per cent) of the follicles in group 2, and 5 (83 per cent) of the follicles in group 3 showed epithelium in both forms.

The connective tissue in 36 of the 100 follicles had a loose, myxomatous arrangement or contained regions in which tissue was so arranged. An effort was made to determine whether there was any correlation between the age of the patient and the presence of myxomatous connective tissue in the follicle, but nothing of significance could be demonstrated.

## Summary and Conclusions

One hundred dental follicles from embedded teeth have been studied microscopically, and the results have been correlated with the information obtained from the dental roentgenogram.

The following are the conclusions reached from this study:

1. Epithelium is present in a large percentage of follicles of embedded teeth. Eighty-six per cent of the follicles in this series showed epithelium as lining epithelium or isolated nests of epithelial cells, or both.

2. A large percentage of follicles, 70

Incidence of epithelial lining, epithelial lining or epithelial nests, epithelium in both forms, and myxomatous connective tissue in dental follicles

| Group | Width of pericoronal space, mm. | Total follicles | Epithelial lining | | Epithelial lining or epithelial nests | | Epithelium in both forms | | Myxomatous connective tissue | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent |
| 1 | 0.5 to 1.5 | 64 | 41 | 64 | 53 | 83 | 29 | 45 | 27 | 42 |
| 2 | 1.5 to 2.5 | 30 | 24 | 80 | 27 | 90 | 17 | 57 | 8 | 27 |
| 3 | 2.5 to 3.5 | 6 | 5 | 83 | 6 | 100 | 5 | 83 | 1 | 17 |
| Total | | 100 | 70 | 70 | 86 | 86 | 51 | 51 | 36 | 36 |

per cent in this study, have an epithelial lining.

3. The epithelium lining the follicle in many cases is of simple stratified squamous cells, but frequently it is cuboid or columnar.

4. The percentage of follicles showing epithelium as a lining or as isolated nests, or both, varies directly with the width of the pericoronal space.

5. A loose, myxomatous type of connective tissue appears frequently in follicles from embedded teeth. Thirty-six per cent of all the follicles examined in this study showed connective tissue of this type.

# MEDICATION AND PULP PROTECTION FOR THE DEEP CAVITY IN A CHILD'S TOOTH

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Are bacteria present in the dentin of prepared cavities? What methods have been used in an attempt to sterilize dentin, and with what success? Suppose sterilization fails, what harm is done? These are some of the questions which will be discussed in this paper.

Under the general heading of pulp protection, the paper will discuss the necessity for pulp protection, with special reference to children's teeth, the causes of pulp death, and methods of preventing damage to the pulp.

## Medication

The entire subject of dentin medication is in a confused state. The literature abounds with statements, mainly without accompanying scientific evidence, which advocate various methods of treating deep cavities.

For every statement that is made favoring one method of treatment, another statement can be found which refutes it. In looking for proof one is often forced to the conclusion that the evidence is mostly the private opinion of the author. Without attempting to detract from its validity, the statement of Prime[1] that silver nitrate has the ability to transform carious dentin ". . . a leatherlike substance, saturated with acid and bacteria, into a hard, sterile, alkaline to neutral, inert substance which may be burnished like a piece of amalgam" will be used as an example. Although it may be true, there is no evidence offered to show that the pH of the treated dentin is now neutral or on the alkaline side, nor is any bacteriologic evidence offered to show that the dentin is now sterile. Additional research with a sufficient number of cases to be authoritative, is indicated in the field of dentin medication.

*Presence of Bacteria.*—Before determining the necessity for sterilization of the dentin, it is necessary to determine that microorganisms are present in the dentin after the cavity has been prepared. Some controversy exists over this point.

Read at the eighty-eighth session of the American Dental Association, Boston, August 4, 1947.

1. Prime, J. M., Further Extending the Use of Howe's Ammoniacal Silver Nitrate in Control of Dental Caries. *D. Cosmos* 77:1046 (Nov.) 1935.

There is evidence both for and against the theory that the invasion of bacteria into the dentin precedes decalcification. A brief review of this evidence is included here.

Black's[2] studies led him to conclude that dissolving out of the calcium salts preceded bacterial invasion of the dentin. Hopewell-Smith[3] also demonstrated a zone which he called the "non-infected zone," between the decalcified area of dentin and the bacterially invaded area. Canby and Bernier,[4] in their studies on dental caries, concluded that in many cases a sterile area existed between the deep carious mass and the pulpal floor. An investigation by Dorfman, Stephan and Muntz[5] apparently confirmed the foregoing observations. In culturing the dentin from successively deeper layers it was noted that a layer of sterile, decalcified dentin was usually present below the deep layer of carious dentin.

On the other hand, there is evidence to show that bacterial invasion precedes decalcification. Henrici and Hartzell[6] believe that the pulp is invaded by microorganisms long before it is actually exposed by caries. Howe[7] stated that "cavities as they are ordinarily prepared for filling are not sterile." Kronfeld[8] stated that the first step of caries of the dentin is invasion of the tubules by microorganisms, next follows the decalcification of the surrounding matrix by the action of these microorganisms. Appleton[9] also said that "in any tooth in which dental caries has involved the dentin the pulp must be regarded as at least potentially infected. The fact that bacteria penetrate farther into the dentinal tubuli than is indicated by any gross change in the dentin has led clinicians to attempt to sterilize the cavity wall before introducing the filling material."

Zander[10] found microorganisms in the hard dentin at the cavity floor in 4 out of 10 cavities which he studied histologically.

In 1943, a study of 286 pulps exposed by caries was made by Hayes.[11] One hundred and seven (34.6 per cent) were sterile, whereas 179 (65.4 per cent) were infected upon first bacterial study. Hayes concluded that in most cases, where the dentin is carious down to the pulp chamber, bacteria have preceded the carious process in the dentin. Thoma[12] believed that vital pulps could be chronically infected from bacterial activity in an imperfectly sterilized cavity.

In my study the dentin at the floor of the cavity was cultured preparatory to medicating and filling.[13] Growth was obtained from 46 (93.8 per cent) of 49 deep cavities. Data from a later study[14] increased the totals to 65 positive and 3 negative cultures from the dentin of deep cavities. There can be no explaining away of this evidence even by employing the argument of contamination (although the cultures were taken under the usually accepted asceptic technic). Assuming that all the cavities were contaminated,

2. Black, G. V., *Operative Dentistry*, vol. 1, ed. 7. Chicago: Medico-Dental Publications Company, 1936.

3. Hopewell-Smith, A., *The Normal and Pathological Histology of the Mouth*, vol. 1, ed. 2. Philadelphia: P. Blakiston's Son & Co., 1918, p. 132.

4. Canby, C. P., and Bernier, J. L., Bacteriologic Studies of Carious Dentin. *J.A.D.A.* 23:2085 (Nov.) 1936.

5. Dorfman, Albert; Stephan, R. M., and Muntz, J. A., In Vitro Studies on Sterilization of Carious Dentin. II. Extent of Infection in Carious Lesions. *J.A.D.A.* 30:1901 (Dec.) 1943.

6. Henrici, A. T., and Hartzell, T. B., A Microscopic Study of Pulps from Infected Teeth. *Brit. D. J.* 42:497 1921.

7. Howe, P. R., A Method of Sterilizing, and at the Same Time Impregnating with a Metal, Affected Dentinal Tissue. *D. Cosmos* 59:891 (Sept.) 1917.

8. Kronfeld, Rudolf, *Histopathology of the Teeth and Their Surrounding Structures*, ed. 2. Philadelphia: Lea and Febiger, 1939, pp. 77, 127.

9. Appleton, J. L. (editor), *Control of Pain in Dental Practice*, ed. 2. Philadelphia: Lea and Febiger, 1939, p. 339.

10. Zander, H. A., Bacteria in the Dentin After Cavity Preparation. *Illinois D. J.* 9:207 (June) 1940.

11. Hayes, R. L., Clinical and Bacteriological Study of 340 Pulp Therapy Cases. *J. D. Res.* 22:301 (Oct.) 1943.

12. Thoma, K. H., The Infected Vital Pulp: An Important Focus of Systemic Disease. *J. D. Res.* 8:529 (Aug.) 1928.

13. Seltzer, Samuel, The Bacteriologic Status of the Dentin After Cavity Preparation. *J.A.D.A.* 27:1799 (Nov.) 1940.

14. Seltzer, Samuel, The Comparative Value of Various Medicaments in Cavity Sterilization. *J.A.D.A.* 28: 1844 (Nov.) 1941.

the fact still remains that such a situation exists in the dentin after a cavity is prepared and ready to be filled. The burden of proof as to the innocuousness of these organisms must rest upon those who belittle the need for cavity sterilization.

A possible explanation for the 2 theories is given by Zander[16] who believed that it could be made on the basis of the investigations of Hanazawa.[15] The latter differentiated between an acute and chronic form of caries. In the acute form, decalcification precedes bacterial invasion. In the chronic form the bacteria penetrate deep into the dentin before it has softened. Zander[16] believed that the acute form is seen more often in children's mouths. This statement is not borne out by my investigations which were all made on children. Younger and Gottlieb[17] believed that where acidogenic microorganisms were present, decalcification by acid may produce an opaque hypercalcification in the periphery through filling-in of the dentinal tubules with calcium salts. This hypercalcified barrier prevents spreading of microorganisms. In other cases, no barrier is formed and caries progresses to the pulp.

***Experiments on Dentin Sterilization.***—If bacteria are present in the dentin after cavity preparation, can they be eliminated by antibacterial agents and, if so, which are the best drugs to use for this purpose? Several *in vitro* studies have been made on this problem by Miller,[18] Barker[19] and Waas.[20] More recently the results of a study by Muntz, Dorfman and Stephan[21] are worthy of consideration. In testing the antibacterial efficiency of 17 germicides on cubes of carious dentin from 0.8 to 1.4 mm. thick, only saturated silver nitrate solution and 30 per cent hydrogen peroxide ("Superoxol") were able to sterilize. However, they did not sterilize in every case. Silver nitrate sterilized 64 per cent of the samples of larger pieces (1.1 to 1.5 mm.) and 84 per cent of the samples of smaller pieces (0.8 to 1 mm.). This agrees essentially with the work of Barker[19] who found that silver nitrate was the only drug capable of sterilizing artificially infected cubes of dentin in five minutes. However, the results of both of these studies [19, 21] must be accepted with reservations inasmuch as the dentin of a carious cavity is never immersed in an antibacterial solution *in vivo*, as it was in these studies.

In the second part of this investigation,[21] the depth of penetration of silver nitrate was studied by embedding a large rectangular block of carious dentin in paraffin, and applying silver nitrate to the dentin exposed at the top of the block. It was found that the time of exposure was important. A three minute application did not consistently sterilize to a depth of more than 0.25 mm. of carious dentin, whereas a ten minute application sterilized most of the samples down to the 0.75 mm. depth. Sterilization was paralleled by an increase in the average silver content and the depth of penetration of silver nitrate was greater than the depth of sterilization.

In the third part of this investigation[21] it was found, by means of a special apparatus which permitted determination of the depth of sterilization produced by germicides, that a saturated solution of silver nitrate sterilized carious dentin to an average of 0.3 mm. by a one minute application, 0.7 mm. by a three minute

15. Hanazawa, K., Caries of dentin. *Vierteljahrschrift für Zahnheilkunde* p. 417, 1923.

16. Zander, H. A., Use of Silver Nitrate in the Treatment of Caries. *J.A.D.A.* 28:1260 (Aug.) 1941.

17. Younger, H. B., and Gottlieb, B., Hypercalcified Dentin Prevents Spread of Caries and Damage to the Pulp. *J. D. Res.* 25:164 (June) 1946.

18. Miller, W. D., Comparative Rapidity with Which Different Antiseptics Penetrate Decalcified Dentine; or, What Antiseptics Should Be Used for Sterilizing Cavities Before Filling? *D. Cosmos* 33:337 (May) 1891.

19. Barker, J. N., The Sterilization of Dentine. *Australian J. Dent.* 39:156 (May) 1935.

20. Waas, M. J., Medicaments Free from Caustic Effects for Sterilization of Deep Carious Dentin. *D. Cosmos* 67:901 (Sept.) 1925.

21. Muntz, J. A.; Dorfman, Albert, and Stephan, R. M., In Vitro Studies on Sterilization of Carious Dentin. I. Evaluation of Germicides. *J.A.D.A.* 30:1893 (Dec.) 1943.

application and 1.3 mm. by a ten minute application.

The general conclusions reached from these studies were that a saturated solution was the most effective dentin sterilizing agent, being even better than Howe's ammoniacal silver nitrate, and that decreasing the time of exposure or lowering the concentration of silver nitrate decreased the efficiency of sterilization.

It must be borne in mind, however, that these were *in vitro* studies. A recent controversy between Bodecker and Lefkowitz[22] on the one hand and Zander and Smith[23] on the other over the existence of lymph channels in the dentin has emphasized the fact that there is a difference in permeability between teeth with and without living pulps. Zander and Smith[23] demonstrated that silver nitrate penetrated readily through the dentin of pulpless teeth. They believed that the penetration of silver nitrate could be explained by capillary attraction, diffusion and differences in pressures. According to Bodecker and Lefkowitz[22] "the removal of the dental pulp temporarily increases the permeability of the dental tissues, indicating that this organ is active in regulating the diffusion of the tissue fluid." It is clear, therefore, that *in vitro* studies must be accepted with reservations since, as Mandel and Sarkady[24] pointed out, "results published on the basis of experimentation with extracted teeth can be considered only an indication of the true picture because loss of vitality has been shown to influence permeability."

Several points, such as the depth of penetration, are controversial. For example Zander,[10] in order to show the relationship between bacterial penetration and the penetration of the dentinal tubules by silver nitrate, prepared 10 cavities in the mouth and treated them with silver nitrate. Immediately afterward the teeth were decalcified and sectioned. The results showed that the penetrating power of silver nitrate is independent of the invasion of bacteria into the dentin. In several cases, the bacteria penetrated farther than the silver nitrate solution. In several other cases, however, Zander and Burrill[25] showed that as time goes on the depth of penetration increases until eventually the silver nitrate will penetrate all the way through the dentin to the pulp.

Further research is indicated to clear up such issues as the depth of penetration of silver nitrate, the importance of exposure time, and the differences in effect, of Howe's ammoniacal silver nitrate and aqueous solution of silver nitrate.

The literature abounds with recommendations for dentin and pulp medication from various clinicians. Unfortunately many statements are made and many drugs are advocated without accompanying scientific proof of their efficacy. For example, Best[26] irrigated a cavity with warmed surgical solution of chlorinated soda for ten to fifteen minutes and then placed a mixture composed of zinc, magnesia, silver nitrate powder and eugenol. Davis[27] flooded the cavity with ammoniated hydrogen peroxide, dried, placed ammonia water for one or two minutes, bathed the cavity with hot tap water and sealed in camphor and phenol or oil of cloves for 24 hours in deep-seated cavities where there is a slight pulp involvement. North[28] used silver nitrate on the base of the cavity and phenol on the side walls. Novitzsky[29] recommended

22. Bodecker, C. F., and Lefkowitz, Wm., Further Observations on the Vital Staining of Dentin and Enamel. *J. D. Res.* 25:387 (Oct.) 1946.

23. Zander, H. A., and Smith, H. W., Penetration of Silver Nitrate into Dentin. II. *J. D. Res.* 24:121 (June) 1946.

24. Mandel, I. D., and Sarkady, L. S., Introduction of Sodium Iodide into the Calcified Dental Tissues. *J. D. Res.* 25:95 (April) 1946.

25. Zander, H. A., and Burrill, D. Y., The Penetration of Silver Nitrate Solution into Dentin. *J. D. Res.* 22:85 (April) 1943.

26. Best, E. S., The Relation of Deep-Seated Caries to Pulp Canal Involvement. *J.A.D.A.* 14:1859 (Oct.) 1927.

27. Davis, W. C., Management of Endangered and Involved Pulps. *J.A.D.A.* 24:428 (March) 1937.

28. North, E. J., Protecting the Pulp in Deciduous and Young Permanent Teeth. *J.A.D.A.* 31:86 (Jan.) 1944.

29. Novitzsky, Josef, Saving Vital Teeth. *D. Items Interest* 66:975 (Oct.) 1944.

the use of thymol and cement linings on the floor of a cavity. Day[30] sealed thymol into a cavity for four weeks preparatory to filling. Scheu[31] employed a 2 per cent chloramine solution followed by chemically pure carbon tetrachloride. Coolidge[32] recommended a 4 per cent solution of chloramine T. Petrie[33] used a mixture of equal parts of geraniol, citral and eugenol to which a small crystal of thymol had been added.

In an effort to clarify this situation, I[14] devised a method of testing the antibacterial effectiveness of various medicaments. This was done *in vivo,* by culturing the dentin at the base of a cavity, after preparation, before and after the application of a medicament for three minutes. These tests were conducted mainly on young permanent molars of children. Cultures were taken one to two weeks later.

On the basis of these tests, conducted in two separate series, a comparison of the efficacy of various, commonly used dentin-sterilizing agents was made. The conclusions reached were only an indication and not absolute, inasmuch as the number of cases tested was small. This number was reduced when an effort was made to recheck one year later. Also the question of time of application of a drug should be investigated more thoroughly to determine its relative importance.

In the first series (such commonly used agents as phenol, both pure and in alcoholic solution, thymol in ethyl alcohol, and Howe's ammoniacal silver nitrate) a variety of beechwood creosote called "Morson's Kreosote" was found to be most effective. This drug was tested on 29 cavities, 24 of which were originally positive and 5 negative. When cultured again one to two weeks later the dentin was found to be sterile in 23 cases and infected in only 6 cases, representing an increase in sterility or sterilizing value of 68 per cent.

When cultured again 1 year later, the dentin of 15 cases treated with "Morson's Kreosote" yielded 5 positive and 10 negative cultures.

Ordinary beechwood creosote did not produce results that compared favorably with those received with "Morson's Kreosote." The fact that different varieties of creosotes will vary in their antibacterial potency has been established by other investigators.

"Creosote is a mixture, in indefinite proportions, of a large number of phenolic bodies, of which at least ten have been identified. The most abundant single ingredient is usually creosol, and the next is guaiacol. The experiments of Gershenfeld, Pressman and Wood[34] indicate that these are not the most important ingredients from the therapeutic standpoint. They found that many of the other ingredients, especially the xylenols of which there are present at least two isomers, were three or four times as powerful germicidally as either of the pyrocatechol derivatives."[35]

The results with Howe's ammoniacal silver nitrate are also of interest. Of 25 cavities cultured originally, 20 were positive and 5 were negative. One to two weeks after application of the ammoniacal silver nitrate solution, cultures of the dentin were still positive in 18 cavities and negative in only 7. These studies indicate the ineffectiveness of Howe's silver nitrate as a sterilizing agent for carious dentin.

In the second series,[36] a drug com-

30. Day, H. W., Thymol in Cavity Sterilization. *J.A.D.A.* 31:605 (May) 1944.

31. Scheu, C. H., Inlay and Bridge Abutment Construction. *J. Wisconsin D. Soc.* 20:147 (Sept.-Oct.) 1944.

32. Coolidge, E. D., The Treatment of Deep Dental Caries. *Illinois D. J.* 1:363 (May) 1932.

33. Petrie, J. M., Protection of the Dental Pulp. *D. Gaz.* 12:280 (Feb.) 1946.

34. Gershenfeld, L.; Pressman, R., and Wood, H. C., Jr., The Bactericidal Efficiency and Toxicity of Creosote and Its Components. *J. Am. Pharm. Assn.* 22:198 (March) 1933.

35. *U. S. Dispensatory,* ed. 23, 1943, p. 351.

36. Seltzer, Samuel, Effectiveness of Antibacterial Agents Used in Cavity Sterilization. *J. D. Res.* 21:269 (June) 1942.

posed of chemically purified 2-chlor-ortho-phenyl phenol and its isomers was easily the best agent tested. This group included such well known antibacterial agents as nitromersol, hexylresorcinol and benzalkonium chloride. Of 20 cavities tested with 2-chlor-ortho-phenyl phenol, all of which exhibited positive cultures of the dentin before treatment, 17 cavities were sterilized when cultured one to two weeks later. This represents a sterilizing value of 85 per cent. This drug is an oily, colorless liquid having a slightly pungent odor and an acrid taste. It is soluble in alcohol, acetone and the glycols, and is only slightly soluble in water. It is interesting to note at this time a recent report by Rosenstein[37] dealing with the treatment of infected root canals with ortho-phenyl-phenol, a related compound. The results that he obtained were favorable. Further experiments with this drug, as well as histologic studies of its effect upon the dental pulp, are indicated.

Even the best of the medicaments failed to sterilize the dentin in 100 per cent of the cases.

Although there have been several reports of the successful employment of penicillin in high dosages for root canal therapy, the literature contains no report on the use of penicillin for cavity sterilization. The antibiotics should be investigated for this purpose. Lawyer, Bibby and Zander[38] reported on the successful sterilization of two carious cavities with 250 units of streptothricin even through layers of carious dentin 2 mm. thick. The pulps of dogs' teeth treated with streptothricin remained perfectly healthy.

*Bacteria Sealed in Cavities.*—If the dentin of some deep cavities is not sterile preparatory to filling, either because of negligence on the part of the operator, or inefficiency of the agent, what is the fate of the bacteria that are sealed under a restoration? The answer to this question remains problematic.

In culturing the dentin one year after it had been treated with an antiseptic and filled, I[39] found that of 93 cases, 63 were positive and 30 negative for bacterial growth. In 56 per cent of all cases treated, the treatment was ineffectual. Recurrence of decay was not demonstrated (as it was not the purpose of this study) but that possibility plus the possibility of damage to the pulp by the bacteria or their toxins must be borne in mind.

Besic[40] examined 10 cavities 12 to 18 months after their preparation and filling. He found that the bacteria have a tendency to die out, but in 3 (30 per cent) of the cases studied, positive cultures of streptococci persisted.

Orban[41] believed that "if a few bacteria are left in the dentinal tubules and if they reach the pulp tissue, they or their toxins will be destroyed by this tissue." Thoma,[12] on the other hand, attributed to infection of a vital pulp the continued sensitivity of a tooth to heat. He believed that the organisms enter the pulp through the dentinal tubules. Petrie[33] believed that more pulps are lost under fillings due to insufficient sterilization than to other causes.

## Pulp Protection

Whether or not damage occurs to the pulp appears to depend on the speed and quantity of secondary dentin formation resulting from the carious process plus that caused by operative interference. Caries often reaches the pulp in spite of secondary dentin formation. Just why this

37. Rosenstein, R. F., Ortho-phenyl-phenol in Root Canal Therapy. *J. D. Res.* 25:185 (June) 1946.

38. Lawyer, A.; Bibby, B. G., and Zander, H. A., Some Observations Relating to the Use of Streptothrycin in the Mouth. *J. D. Res.* 25:181 (June) 1946.

39. Seltzer, Samuel, Effective Duration of Some Agents Used for Dentin Sterilization. *J. D. Res.* 21:115 (April) 1942.

40. Besic, F. C., The Fate of Bacteria Sealed in Dental Cavities. *J. D. Res.* 22:349 (Oct.) 1943.

41. Orban, Balint, Biologic Considerations in Restorative Dentistry. *J.A.D.A.* 28:1069 (July) 1941.

happens in some cases and not in others is as Kronfeld[8] pointed out, "one of the many problems of biology that are still without solution."

In children's dentistry, especially, the operator must exercise extreme care that the stimulation introduced in preparing and restoring a cavity is productive rather than destructive. It is no longer possible to regard the dentin and pulp as separate entities. They must be considered as parts of one living tissue. Any interference with the dentin will result in manifest changes in the pulp because the dentin is a vital tissue. The odontoblasts though placed with their bodies in the pulp are part of the dentin.

*Necessity for Pulp Protection.*—It must be remembered that in children's teeth the pulp must be protected against damage more carefully than in adult's teeth because the dentin of young permanent teeth is more permeable and the pulps are proportionally larger. Therefore cavities which would ordinarily not be considered as endangering the pulps in adults' teeth are much more dangerous to the pulp in children's permanent teeth. According to Bodecker[42] the deciduous teeth are comparable to adult teeth in that the mechanism which he called "protective metamorphosis," that is, blocking of the dentinal tubules by a calcified plug and a gas, already has taken place.

*Causes of Pulp Death.*—The causes of death of the pulp may be summarized as follows:

1. Bacterial invasion from the dentin.

2. Trauma prior to insertion of the restoration caused by (*a*) injudicious instrumentation; (*b*) heat produced by rapid operative technic; (*c*) use of unsuitable drugs.

3. Traumatic influence of the restorative materials caused by (*a*) irritating chemicals in the filling material; (*b*) pressure during insertion of the filling; (*c*) thermal shock conveyed through metallic fillings.

The arguments as to whether or not the bacteria precede decalcification have already been presented. Assuming that the pulp will destroy a limited number of bacteria and their toxins once it has been invaded, it is not possible, as Lefkowitz[43] pointed out, to measure the tolerance of any individual pulp to irritation. If the infection persists, the pulp eventually will die.

A rapid operative technic is condemned because the heat produced is sufficient to cause injury to the pulp to the point where secondary dentin formation is either irregular or stops completely because of necrosis.

Fish[44] demonstrated in histologic section, that formation of secondary dentin in the teeth of dogs and monkeys results from peripheral injury, and when the injury is severe, this secondary dentin is delayed for several months because of necrosis of the affected area of the pulp. This observation was confirmed by Bevelander and Benzer[45] in a study of 300 extracted human teeth. Manley[46] reported that indiscriminate cavity preparation may cause hemorrhage and necrosis of the pulp. Reports by Gurley and Van Huysen[47, 48] showed severe pulp changes in cavities excavated to half the thickness of the dentin in dogs' teeth. The deeper the cavity the greater is the reaction.

42. Bodecker, C. F., Dangers of Extensive Operative Procedure on Recently Erupted Teeth. *J.A.D.A.* 28: 1598 (Oct.) 1941.

43. Lefkowitz, William, Effect of Operative Procedures on Noncarious Teeth of Young Persons. *J.A.D.A.* 29:1864 (Oct.) 1942.

44. Fish, E. W., Pathology of the Dentine and the Dental Pulp. *Brit. D. J.* 53:351 (Oct.) 1932.

45. Bevelander, Gerrit, and Benzer, Sidney, Morphology and Incidence of Secondary Dentin in Human Teeth. *J.A.D.A.* 30:1075 (July) 1943.

46. Manley, E. B., Investigations into the Early Effects of Various Filling Materials on the Human Pulp. *D. Record* 62:1 (Jan.) 1942.

47. Gurley, W. B., and Van Huysen, Grant, Histologic Response of the Teeth of Dogs to Operative Procedures. *J. D. Res.* 19:179 (April) 1940.

48. Van Huysen, Grant, and Gurley, W. B., Histologic Changes in the Teeth of Dogs Following Preparation of Cavities of Various Depths and Their Exposure to Oral Fluids. *J.A.D.A.* 26:87 (Jan.) 1939.

Even when secondary dentin is formed under such conditions, it is extensive and irregular. As Bodecker[49] pointed out, it is much better to have a slow physiologic formation of secondary dentin.

According to Henschel[50] the heat generated by a revolving bur can rise as high as 270 F. The tolerance zone of dentin is 130 F. Hawes[51] showed that heat, produced in a deep cavity by electrocautery, is sufficient to cause a condition comparable to blistering of the skin. Temperatures over 45 C., applied to the dentin for a sufficient time to heat a part of the pulp to an equal degree, will cause irreversible changes in that part of the pulp. The ability of the damaged portion of the pulp to form secondary dentin is apparently destroyed. Bodecker[52] described the heat generated from a rapid operative technic as "cooking the pulp in its own juice," and blames the common use of epinephrine in procaine hydrochloride anesthesia as a common cause because it constricts the capillaries and thus reduces the cooling effect of the blood upon the pulp.

According to Manley,[53] Gurley and Van Huysen,[54] Zander [55] and James and Diefenbach,[56] changes in the pulp can be avoided, apparently in spite of the heat produced, by the use of zinc oxide and eugenol in a deep cavity immediately after preparation.

Numerous investigators have proved that various types of filling materials, especially cements, exert a harmful influence upon the dental pulp.

Gurley and Van Huysen[47] in several studies on dogs' teeth filled with different types of cements, observed that some degree of injury to the pulp occurred six months later in every case except that of the cavity filled with zinc oxide and eugenol. The list of cements included "Pulprotex," zinc phosphate cement, silicate cements, temporary stopping, and red copper cement. Manley[46, 53] prepared cavities in human teeth and filled them with silicate cements, copper oxyphosphate cement, zinc oxide and eugenol and amalgam. He noted that silicate cements have a marked irritant effect on the pulp, producing degenerative changes two weeks after insertion into a shallow cavity. Even silver amalgam produced a definite reaction, although not severe. Copper oxyphosphate cement was found to produce a most serious and destructive reaction, which, under a deep cavity, extended into the pulp tissue. He concluded that where the liquid consists mainly of phosphoric acid, dental cements are capable of producing severe localized reactions in the pulp within 24 hours, although reactions set up under zinc phosphate cements appear to be less intense than those resulting from either copper phosphate cements, silicates or certain cements purporting to have special germicidal properties.

Manley and Gurley and Van Huysen agreed that if the irritant causing degeneration and destruction is sufficiently weakened, by virtue of sufficient dentin between the base of the cavity and the pulp, it becomes a stimulant and proliferation will result with the formation of secondary dentin. The severity of reaction in the pulp is due either to the depth of the cavity or to the closeness of the filling material to the pulp and the kind of material used to fill the cavity.

49. Bodecker, C. F., Histologic Evidence of the Benefits of Temporary Fillings and the Successful Pulp Capping of Deciduous Teeth. *J.A.D.A.* 25:777 (May) 1938.

50. Henschel, C. J., The Friction of Revolving Steel Burs. *J.A.D.A.* 31:895 (July) 1944.

51. Hawes, R. R., The Effects of Heat on Vital Dentine and Dental Pulp. *Tufts D. Outlook* 20:5 (June) 1946.

52. Bodecker, C. F., Demonstration of Possible Ill Effects of Heat on the Pulp Caused by Rapid Operative Technic. *J.A.D.A.* 25:527 (April) 1939.

53. Manley, E. B., Pulp Reactions to Dental Cements. *Proc. Roy. Soc. Med. (Sec. Odont.)* 36:488 (July) 1943.

54. Gurley, W. B., and Van Huysen, Grant, Histologic Changes in Teeth Due to Plastic Filling Materials. *J.A.D.A.* 24:1806 (Nov.) 1937.

55. Zander, H. A., The Reaction of Dental Pulps to Silicate Cements. *J.A.D.A.* 33:1033 (Oct.) 1946.

56. James, V. E., and Diefenbach, G. B., Prevention of Histopathologic Changes in Young Dogs' Teeth by the Use of Zinc Oxide and Eugenol. *J.A.D.A.* 29:583 (April) 1942.

Once the pulp has been irritated, ultimate recovery may take place or an abscess may form and the whole pulp may eventually be destroyed.

Zander[55] found that deep cavities prepared in sound teeth and filled with silicate cements gave the most violent pulp reactions.

It would appear dangerous, therefore, to use either cements, whose liquid is phosphoric acid, or metal fillings (because of their thermal conductivity) in deep cavities without an intervening lining of zinc oxide and eugenol. A word of caution is in order about the use of varnish as a cavity liner under silicate cements. It is commonly accepted that varnish will seal the dentinal tubules thereby minimizing the irritation to the pulp. In a recent study by Zander and Vissotsky,[57] in which three different types of cavity varnishes were tested by *in vivo* studies in 100 dogs and 37 human teeth, the teeth which had cavity varnishes applied before they were filled with silicate showed the same type of inflammatory pulp reaction as comparable teeth without varnish. The severity of the reaction was not as great. However, this should be a warning not to depend on varnishes for pulp protection.

***Recommendations.***—From the foregoing discussion it appears that interest in children's dentistry should be directed toward conserving the pulp by means of two procedures. (1) Proper medication so that the dentin will not be traumatized and the pulp thereby injured. At the same time, all the bacteria, or as many as possible, will be eliminated. (2) Stimulation of the pulp, rather than destruction, through operative interference, thereby giving the pulp a chance to form secondary dentin for its own protection.

It is believed that the first factor can be handled best by the application of "Morson's Kreosote" or 2-chlor-orthophenyl phenol to the cavity before, during and after the cavity has been prepared. Thus, not only will the best known antibacterial agents for this purpose be employed, but the duration of application, a possibly important factor, will be lengthened. It is admitted that the effects of these medicaments upon the pulp are not known. Although there have been exhaustive studies of the effects of various filling materials upon the pulp, there have been no comprehensive studies made on the effect of various drugs on the pulp, except in isolated instances. Thomas,[58] for example, noted that phenol produces an inflammatory reaction in the dental pulp, although he believed that it was not sufficient to warrant condemnation of this drug for cavity sterilization. Zander and Burrill,[25] studying the effect of silver nitrate on the pulp, concluded that it was negligible. On the basis of these two studies, I believe the effects of the two drugs recommended would also be negligible, as they are not as caustic as phenol or silver nitrate.

The second factor can be controlled by the use of a slow operative technic, the employment of what Henschel[50] described as "thermal control" in cavity preparation, and the use of temporary fillings on numerous occasions, between beginning and end of cavity preparation. It is inadvisable to attempt immediately an ideal cavity preparation in a large cavity of a child's permanent tooth. Such a procedure is absolutely contraindicated. By opening a large number of fresh tubules in the dentin of a tooth which has not been protected by the natural aging process, the pulp may be given an insurmountable barrier to overcome. The pulp should be given a slight amount of stimulation at each visit. This is accomplished by preparing the cavity in steps, excavating a small amount of decay at

57. Zander, H. A., and Vissotsky, Irene, The Efficacy of Cavity Varnishes in Preventing Pulp Irritation from Silicate Cements. *J. D. Res.* 25:186 (June) 1946.

58. Thomas, B. O., Penetration of Phenol in Tooth Structure. *J. D. Res.* 20:435 (Oct.) 1941.

each sitting. The final ideal cavity preparation should be delayed for three to six months. Although Bodecker[42] advocated the use of oxyphosphate cement or pink base plate gutta-percha dipped in camphorated validol between visits, investigations indicate that a safer procedure is the use of zinc oxide and eugenol. The previously reported successful use of Howe's ammoniacal silver nitrate on 204 borderline cases of deep seated decay by Seltzer and Werther[59] may be attributed, not so much to the use of silver nitrate, as to the step procedure with the use of zinc oxide and eugenol between visits. This, plus allowing time between beginning preparation and the final filling, may have accomplished the desired result.

Orban[41] successfully used 5 to 6 per cent concentration of paraformaldehyde in dogs' teeth to stimulate secondary dentin formation. He believed that it may be employed successfully on human teeth.

Also, the recent success of fluorides in caries prevention indicates that sodium fluoride is worthy of consideration for use in carious cavities. According to Lukomski,[60] sodium fluoride has a great affinity for calcium phosphate. Therefore, topically applied fluoride forms a chemical union with the dentin. Fluoride treated dentin is greatly altered as is seen by its significantly reduced permeability. Lukomski used sodium fluoride in the recalcification of softened dentin in more than 600 cases. This was accomplished by sealing a 0.7 per cent sodium fluoride solution on the floor of the cavity. Observations at periods of six months and a year revealed a hardening of the dentin and arrest of caries without the development of pulpal disease.

On the basis of Lukomski's report this substance would appear to be of great importance. However, caution must be exercised. Two recent reports by Barker[61] and Lefkowitz and Bodecker[62] should be considered. Barker placed a paste of sodium fluoride and glycerin in two cavities and covered them with cement. He extracted one tooth one week later and the other seven weeks later and sectioned them. Photomicrographs of both teeth showed destructive action with large pulp abscesses.

Lefkowitz and Bodecker sealed quantities of 18, 36, and 72 mg. of sodium fluoride in the teeth of dogs and humans. Upon histologic examination they found that the degree of pulp reaction depended on the size of the dose. The larger ones resulted in complete pulp necrosis. Eighteen milligrams of sodium fluoride produced a localized pulp abscess in 24 hours. In seven days the pulp was completely necrosed. Although the quantities are relatively large, these observations nevertheless must be borne in mind before accepting Lukomski's results.

Thoma stated,[12] "A wound in a tooth should have the care and consideration that is given a wound in any part of the body, perhaps more, because the injured dental canals represent a wound surface more easily infected than a cut in the skin. A tooth does not have the facilities for protection that the soft tissues possess. The cleansing of a wound by hemorrhage from it, and the healing process, which, in the soft tissues, includes the formation of a protective crust over the injured surface, are not present in the dentin."—*2035 Spruce Street.*

59. Seltzer, Samuel, and Werther, Lester, Conservative Silver Nitrate Treatment of Borderline Cases of Deep Dental Caries. *J.A.D.A.* 28:1586 (Oct.) 1941.

60. Lukomski, I., Fluorine in Medicine, condensed by Volker, J. F., *Am. Review of Soviet Med.* 2:543 (Aug.) 1945.

61. Barker, J. N., Reactions of the Pulp to Various Filling Materials and Clinical Procedures. *Austral. J. Den.* 46:226 (Oct.) 1942.

62. Lefkowitz, W., and Bodecker, C. F., Sodium Fluoride: Its Effect on the Dental Pulp. *Ann. Den.* 3:141 (March) 1945.

# ORAL HEALTH ACTIVITIES OF THE UNITED STATES PUBLIC HEALTH SERVICE

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THE United States Public Health Service is engaged in many kinds of dental health activity influencing the oral health of the American people. These activities are distributed widely throughout the states, districts, counties and cities. Through research projects, oral public health programs and demonstrations of clinical care, the U. S. Public Health Service is actively promoting every means of improving the oral health of all the people.

In a recent issue of THE JOURNAL[1] the scope of dental research of the Service was outlined. The total impact of this research work is not yet apparent to the general population although the participating population groups are well aware of the progress that has been made.

Through research grants-in-aid, research fellowships and, in the future, appointment of trainees, the men and women of the nation's universities and members of the profession as a whole will have an opportunity to join in the quest for better oral health. Everyone will gain either directly or indirectly through these efforts. Funds appropriated by Congress will thus find their way back into the areas of origin to the men, women and children of the nation.

Social Security funds have been available since 1936 for use as grants-in-aid to states and territories for general health services. Portions of these have been and are being used to promote state oral health programs.

Congress last year appropriated $1,000,000 for nationwide demonstration of a method for caries prevention. At present thirty-four demonstration teams of the Service are at work in the states and territories. These particular demonstrations are for the purpose of acquainting local professional and lay groups with the technic of application and the caries preventive action of 2 per cent aqueous solution of sodium fluoride.

The use of this method for control of caries in the teeth of children is offered to the profession and to the people. Acceptance of the method is the responsibility of the dentist and his patients. The selection of areas for demonstrations in the states and territories is the responsibility of the state departments of health in cooperation with state and local dental societies.

Another oral health activity of the U. S. Public Health Service within the states is that conducted among adult wage earners by the Division of Industrial Hygiene since 1942 to improve the oral health of the nation's industrial employees. Several highly industrialized states have requested assistance in clinical and environmental investigation of specific industrial groups. The oral health findings of these surveys and studies have been responsible for development and establishment of adequate control measures. This work is being extended to other states in which the people, through

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1. Dean, H. T., and Arnold, F. A., Jr., Dental Research and the National Institute of Health. *J.A.D.A.* 38:15 (Jan.) 1949.

their health authorities, are showing marked interest in oral health programs.

Still another Public Health Service activity is showing progress on the local scene. The Division of Federal Employee Health is enlisting the assistance of local dentists in a program to improve the oral health of men and women located in areas where federal employees are concentrated.

Establishment of the National Institute of Dental Research in the U. S. Public Health Service, together with a renewed interest in the development of local health units and enlargement of state-wide oral health programs, is an indication that the nation is concerned with oral health. Demonstration of new and improved preventive methods for control of oral diseases is bringing about expansion of these activities at the state and local levels. This increased activity within the states indicates the pace at which oral health functions of the U. S. Public Health Service are moving.

The growth and effect of such programs in the nation will be measured by the number of persons who dedicate themselves to the task of improving the nation's oral health. There is a critical shortage of personnel in this field today. As the various programs grow in public acceptance it is expected that the professional ranks will be constantly supplemented by young men and women attracted to the oral health field by the challenge, growing need and dignity of the profession.

## GINGIVAL BIOPSY: A NEW TECHNIC FOR DIAGNOSIS OF GENERALIZED AMYLOIDOSIS

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The diagnosis of generalized amyloidosis is frequently of considerable importance in the management of certain illnesses. Amyloidosis occurs as a complication of a variety of diseases, including syphilis, rheumatoid arthritis, traumatic wounds, Hodgkin's disease, malignant tumor, silicosis, ulcerative colitis and bronchiectasis. It is observed most often in association with tuberculosis and is, indeed, the most common complication of that disease, being noted at post-mortem examination in more than 20 per cent of cases.[1, 2] Moreover, it is a serious event, and a patient often withstands a primary disease only to succumb to amyloidosis caused by it.

Although amyloidosis has been recognized for more than a century, its nature is still not clear. Amyloid substance is a peculiar material, largely protein, which may be widely deposited in the tissues of the body when one of the aforementioned conditions is present. Although in atypical forms the disease may be localized or limited to a few tissues, usually it

This work was done at Sea View Hospital, Staten Island, N. Y., in 1945 and 1946. Dr. Selikoff was resident in the Department of Medicine and Dr. Herschfus was chief resident of the Department of Oral Surgery at that time.

1. Rosenblatt, M. B., Amyloidosis and Amyloid Nephrosis. *Am. J. M. Sc.* 186:558 (Oct.) 1933.

2. Campuzano, Luis; Cardenas, C. N.; Rodriguez Jiménez, J. M., and Ledon, C., Degeneracion Amiloidea y Tuberculosis. *Rev. tuberc., Habana* 5:102, 1941.

affects almost every part of the body, including the kidneys, pancreas, liver, lymph glands, heart, adrenal glands, thyroid, prostate, blood vessels and spleen. In most cases its presence is apparently innocuous, and the organ affected shows no measurable dysfunction. In some cases, however, especially when large amounts of amyloid are present, there may be failure of the organ involved, with disability or death resulting, perhaps because of the mechanical effect of the "infiltration." Amyloidosis of the adrenal glands has caused Addison's disease, and renal amyloidosis frequently leads to a nephrotic syndrome and uremia, or both.

## The Congo Red Test

In clear-cut amyloidosis, diagnosis is usually not difficult. In the presence of a disease known to cause it, enlargement of the liver and spleen, proteinuria and edema form a syndrome that suggests generalized amyloidosis. Unfortunately, this typical syndrome has been estimated to occur in fewer than 25 per cent of cases.[3] In the remaining 75 per cent, the picture is less clear-cut, and the Congo red test is used as a diagnostic aid. Based on the peculiar property of amyloid substance to bind or "absorb" Congo red, the test consists of the injection of a measured amount of this colloidal dye and the estimation of the amount of the dye remaining in the circulating blood one hour after injection. If amyloidosis is not present, most of the dye remains in the blood when it is examined, but if much amyloid material is present in the body, the dye is absorbed by it, and little or none appears in the circulating blood one hour after injection.

Bennhold's Congo red test is useful in the diagnosis of the disease. Nevertheless, it has serious limitations. First of all, when there is only a moderate amount of amyloid in the body, it absorbs little dye, and the test gives the same results as when none is present.[4] Second, even complete absorption of injected Congo red is occasionally misleading,[5] and although definitive diagnostic criteria has been established,[6] they require repeated testing, which is not altogether innocuous.[7]

## Biopsy in Diagnosis

Because of the disadvantages of the Congo red test, especially its inability to detect moderate amyloidosis, alternative diagnostic procedures have been sought. The most promising of these has been biopsy, which has the advantage of establishing an unequivocal diagnosis. This technic had been successfully used even before the introduction of the Congo red test. Waldenström[8] performed biopsies of the liver in 1917, and Josefson[9] did biopsies of the spleen a year earlier. Other workers have used the method sparingly, but it has never become widely popular, mainly because removal of a specimen by aspiration is not without occasional danger and laparotomy is not readily acceptable to the patient.

The livers and spleens from which biopsy specimens were removed by Waldenström and Josefson were palpably abnormal and thereby invited anatomic examination. Unfortunately, no superficial tissues call attention to themselves in the presence of generalized amyloidosis. In particular, the skin and the mucous membranes of the oral cavity appear normal in this disease, giving no hint that they may contain any unusual substance.

3. Altnow, H. O.; Van Winkle, C. C.; Maly, H. W., and Williams, L. E., Renal Amyloidosis: Clinical Course and Pathologic Lesions in 16 Cases. *Arch. Int. Med.* 56:944 (Nov.) 1935.

4. Selikoff, I. J., The Significance and Interpretation of the "Doubtful" Congo Red Test. *Quart. Bull., Sea View Hosp.* 8:194 (July) 1946.

5. Stemmermann, M. G., and Auerbach, O., The Value and Limitations of the Congo Red Test for Amyloidosis. *Am. J. M. Sc.* 208:305 (Sept.) 1944.

6. Selikoff, I. J., Diagnosis of Generalized Amyloidosis by the Congo Red Test: Definitive Diagnostic Criteria. *Am. J. M. Sc.* 213:719 (June) 1947.

7. Selikoff, I. J., and Bernstein, I. J., Systemic Reactions to the Intravenous Administration of Congo Red. *Quart. Bull., Sea View Hosp.* 8:131 (April) 1946.

8. Waldenström, H., Formation and Disappearance of Amyloid in Man. *Acta chir. Scandinav.* 63:479, 1928.

9. Josefson, A., cited by Waldenström.[8]

Nevertheless, there is good reason to suspect that these tissues may contain amyloid. As noted earlier, when amyloid is present at all, it is usually widely distributed, and there is no reason to suspect that the oral tissues will escape infiltration. On the contrary, since perivascular zones are sites of predilection for deposition of amyloid, the gingivae, because of their vascular nature, would seem to constitute an especially fertile region in which to seek the material. This has been emphasized previously.[10]

Biopsy of oral tissues for amyloidosis is therefore a promising procedure. It is also a technically inviting one. The tissue to be studied is easily accessible, and the operation for its removal is readily acceptable to the patient, being simple and safe. Several anatomic variations peculiar to this region aid in making it suitable for removal of a biopsy specimen. First, although the gingivae contain numerous blood vessels, these are surrounded by intertwining bundles of fibrous and elastic tissue anchored on the underlying periosteum. The retraction of these fibers after incision makes excessive bleeding uncommon, since the severed vessels are promptly ligated physiologically. Second, in the gingivae, as in the oral mucous membrane generally, few pain-sensitive nerve endings are present, so that the injection of an anesthetic may often be foregone.[11] Third, the tissues are highly resistant to infection, and rapid healing may be expected.

To ascertain whether gingival biopsy would be helpful in the diagnosis of generalized amyloidosis, 50 subjects were studied, including patients in whom the diagnosis of amyloidosis had been firmly established, persons without stigmas of the disease and subjects for whom the diagnosis had been considered but could not be definitely made.[12] Most patients with clinically diagnosed amyloidosis had definite deposits of amyloid in specimens examined. This result, in itself, was gratifying, since it demonstrated that anatomic confirmation of the presence of a generalized disease is possible by gingival biopsy. Of even greater interest was the finding that the method may give positive evidence of amyloidosis in the face of incomplete clinical evidence of the disease, when the diagnosis cannot be made otherwise. In several cases of moderate amyloidosis, in which repeated Congo red tests gave negative results, amyloid was found in the biopsy specimen. This observation is of considerable importance because, heretofore, there has not been available any simple method for diagnosing moderate amyloidosis.

Biopsy specimens were removed from one of two sites, either the gingival mucosa proper or the mucobuccal fold, since no information was available concerning the suitability of either. Amyloid was found in both regions, and from the limited data obtained in this study we are unable to say that it is more likely to be found in one than the other. However, there are reasons, noted hereafter, for preferring one or the other in some instances.

## Technic

After antiseptic preparation of the chosen site, a piece of tissue approximately 3 by 5 mm., containing epithelium and subepithelial connective tissue, was excised with forceps and a sharp scalpel. No anesthetic was used in most cases, although in a few instances procaine hydrochloride was given by local infiltration. This was necessary usually when the specimen was removed from the mucobuccal fold. A paste of equal parts zinc oxide, eugenol and sulfathiazole, mixed to a firm consistency, was then applied

10. Auerbach, O., and Stemmermann, M. G., Surgery in the Tuberculous Patient with Amyloidosis. *Am. Rev. Tubere.* 53:333 (April) 1946.
11. Lewis, Thomas, *Pain.* New York: The Macmillan Company, 1942, p. 42.
12. Selikoff, I. J., and Robitzek, E. H., Gingival Biopsy for the Diagnosis of Generalized Amyloidosis. *Am. J. Path.* 23:1099 (Nov.) 1947.

to the operative wound, which was left without special treatment after hemostasis was assured. In most cases hemostasis was rapidly achieved, although several patients required one or two sutures, again usually those in whom the biopsy specimen had been taken from the mucobuccal fold. It should be emphasized that the tissue removed always was grossly normal and that the site was selected merely on the basis of convenience, in the mucobuccal fold, for example, if the patient wore full dentures.

On sections from each specimen three stains were used: hematoxylin and eosin, Congo red, and methyl violet. The last was the most satisfactory, being more specifically limited to the amyloid material and giving greater contrast with nonamyloid material than did the Congo red. Congo red is often of great value in the special staining of amyloid substance elsewhere in the body, but it had less utility in our study, since it stained the fibrous, hyaline and muscular elements in the subepithelial layers off-pink, not unlike the color of genuine amyloid deposits, making differentiation difficult. Even in the perivascular areas, Congo red produced confusion, staining the elastic tissues brownish red. The latter difficulty with Congo red has been reported before.[13] Thus, we have come to prefer the use of methyl violet, although this stain makes difficult the preparation of permanently mounted specimens.

The amyloid was principally perivascular, in the vessel-containing areas of the epithelium. Often a number of vessels in the same microscopic field were partially surrounded by the amyloid, but in a number of instances only one vessel in the entire slide was found to be so affected. It was therefore necessary to search every slide carefully, with special attention to the epithelial layers, and, when the diagnosis was doubtful, to review several slides of the same specimen.

The amyloid, when present, stained typically, a characteristic finding in generalized amyloidosis in contrast to the rare primary (atypical) systematized amyloidosis, which also may involve the oral cavity but in which staining is irregular.[14] In cases in which we had the opportunity of examining other amyloid-containing tissues, the amyloid therein did not vary in appearance or staining from that in the gingivae.

Table 1.—Results of biopsy when specimen was taken from gingiva

| Case | Appearance of tissue before biopsy | Biopsy result | Wound healing |
|---|---|---|---|
| 1 | Normal | Positive | Good |
| 2 | Normal | Positive | Good |
| 3 | Hypertrophic | Negative | Good |
| 4 | Normal | Positive | Good |
| 5 | Normal | Negative | Good |
| 6 | Normal | Positive | Good |
| 7 | Normal | Positive | Good |
| 8 | Pale | Positive | Good |
| 9 | Normal | Positive | Good |
| 10 | Normal | Positive | Good |
| 11 | Pale | Negative | Good |
| 12 | Normal | Negative | Good |
| 13 | Pale | Negative | Good |
| 14 | Hypertrophic | Negative | Good |
| 15 | Pale | Negative | Good |
| 16 | Pale and hypertrophic | Negative | Very slow |
| 17 | Pale | Negative | Good |
| 18 | Inflamed | Negative | Slow |
| 19 | Pale | Negative | Good |
| 20 | Normal | Negative | Good |
| 21 | Normal | Negative | Good |
| 22 | Normal | Negative | Good |
| 23 | Normal | Negative | Slow |
| 24 | Pyorrheal | Negative | Good |
| 25 | Normal | Negative | Good |
| 26 | Normal | Negative | Good |

## Choice of Site

As has been mentioned, we are unable to indicate a preference for either the gingiva proper or the mucobuccal fold on

13. Smetana, H., Amyloid Formation. *Bull. Johns Hopkins Hosp.* 37:383 (Dec.) 1925.

14. Michelson, H. E., and Lynch, F. W., Systematized Amyloidosis of the Skin and Muscles. *Arch. Dermat. & Syph.* 29:805 (June) 1934.

the basis of greater probability of establishing the diagnosis of amyloidosis. However, other considerations seem to indicate the gingiva as the site of choice. When material was taken from the mucobuccal fold, healing was less rapid (Tables 1 and 2); hemostasis was less readily secured, and an anesthetic was more often necessary than when tissue was taken from the gingiva. Then, too, infection is dangerous in loose tissue with easy access to the tissue planes in the floor of the mouth. Although we did not observe any spreading infectious process in our series, the possibility speaks against the choice of the mucobuccal fold for removal of tissue. Moreover, in 1 case, despite rapid healing after removal of tissue from the mucobuccal fold, the homolateral part of the lower lip remained numb, probably owing to severance of the labial branch of the inferior dental nerve. No such complication was seen when tissue was taken from the gingiva.

**Table 2.—Results of biopsy when specimen was taken from mucobuccal fold**

| Case | Appearance of tissue before biopsy | Biopsy result | Wound healing |
|---|---|---|---|
| 1 | Normal | Positive | Good |
| 2 | Normal | Negative | Good |
| 3 | Pale | Positive | Good |
| 4 | Normal | Positive | Slow |
| 5 | Normal | Positive | Very slow |
| 6 | Inflamed | Negative | Required resuture; healing took months |
| 7 | Normal | Negative | Slow |
| 8 | Normal | Positive | Slow |
| 9 | Pale | Positive | Good |
| 10 | Normal | Positive | Good |
| 11 | Normal | Positive | Good |
| 12 | Normal | Positive | Required resuture twice |
| 13 | Normal | Positive | Very slow |
| 14 | Normal | Negative | Good |
| 15 | Bleeding | Negative | Good |
| 16 | Normal | Negative | Very slow, leaving heavy scar |
| 17 | Normal | Negative | Very slow |
| 18 | Normal | Negative | Good |
| 19 | Normal | Negative | Very slow |
| 20 | Normal | Negative | Good |
| 21 | Normal | Negative | Good, but with residual numbness of lower lip |

## Comment

It should be noted that failure to find amyloid by gingival biopsy does not rule out the disease. In 4 cases in which biopsy had given negative results we had the opportunity of examining other tissues, either by visceral biopsy or at necropsy. In 2 of these there had been clinical evidence of amyloidosis despite the negative results of biopsy, and in both amyloid was found, in one by biopsy of the liver and in the other at necropsy. Thus, a negative result of biopsy does not rule out generalized amyloidosis, but merely signifies that there is no amyloid substance in the specimen examined. On the other hand, a positive result is valuable, especially when other diagnostic criteria are equivocal, as when the Congo red test gives a negative result. In several cases in which the clinical diagnosis of amyloidosis was suspected but could not be definitely established, gingival biopsy showed amyloid substance. The procedure thus adds a weapon to the clinician's diagnostic armamentarium.

The use of gingival biopsy in diagnosis of generalized amyloidosis indicates, perhaps, the diagnostic potentialities of the gingivae in other systemic diseases. Kruse[15] has studied the changes in the gingivae in vitamin C deficiency, and Kimball and Horan[16] examined tissue from the gums in 2 cases of gingival hyperplasia caused by treatment of epilepsy

15. Kruse, H. D., Gingival Manifestations of Avitaminosis C, with Especial Consideration of Detection of Early Changes by Biomicroscopy. *Bull. Hyg.* 18:147 (Feb.) 1943.

16. Kimball, O. P., and Horan, T. N., The Use of Dilantin in the Treatment of Epilepsy. *Ann. Int. Med.* 13:787 (Nov.) 1939.

with diphenylhydantoin sodium. Our experience indicates that gingival biopsy may be useful in other generalized diseases affecting either the blood vessels proper or the perivascular tissues, for example, periarteritis nodosa, disseminated lupus erythematosus and some types of hypertension. For this reason it would be desirable to study the appearance of normal gingival vessels to determine in what ways they differ from vessels in other parts of the body. For example, there appears to be a greater amount of perivascular fibrous and elastic tissue about the arterioles of the gingivae than about many other arterioles of similar size in the body. The finding of evidence of one generalized disease in the gingivae suggests that evidence of other diseases might be found there.

## Summary and Conclusion

1. Generalized amyloidosis is a frequent complication of certain diseases, particularly tuberculosis. When present, amyloid is widely deposited in the tissues of the body, including the tissues of the oral cavity.

2. Clinical diagnosis of the condition often is difficult, especially when typical symptoms are absent. Biopsy of the liver and of the spleen has been done for diagnostic aid, but removal of tissue from both organs is difficult and may be dangerous. The Congo red test is useful in diagnosis, but has several serious limitations.

3. Biopsy of the gingivae has been demonstrated to be a simple and effective method of demonstrating amyloid disease. Although its results are not positive in every case of amyloidosis, amyloid substance can be found in many, including some in which every other procedure has failed to demonstrate its presence.

4. It is suggested that gingival biopsy might be useful in the diagnosis of other generalized diseases, especially those of the blood vessels or the perivascular tissues. — *707 Broadway (Dr. Selikoff); 1201 Barlum Tower (Dr. Herschfus).*

▲

*Illusory Value of Nose Drops.*—Recent scientific knowledge indicates that some drugs used in nasal medications may do more harm than good by affecting, or even paralyzing, ciliary movement. Actually, rest and sleep alone will aid the activity of nasal structures and shorten the duration of a "cold." In the presence of infection, extra blood appears on the scene to fight the cause of the trouble, and at the same time more fluid enters the tissues at the site of infection. This results in congestion. The purpose of nose drops is to relieve this congestion of the nasal mucous membrane by causing the local blood vessels to constrict, thus cutting off the blood supply and lessening the swelling. But, is it wise to deprive the nasal tissues of the blood that is intended to combat the infection? This is a question which many investigators are raising today. Research workers are also wondering how much actual destruction of the nasal membrane may occur because of prolonged vasoconstriction with the more powerful drugs.

Further, it has been shown that some time after the swelling diminishes, an actual upsurge of congestion follows as the effects of the vasoconstricting drug wear off, and the end effect is even more congestion. The sufferer, of course, blames this on the "cold" and not on the drug, so he uses the drug again and the cycle is repeated time after time, ending often in a chronically diseased membrane.—*Austin E. Smith, The Drugs You Use. New York: The Revere Publishing Company, 1948, p. 36.*

# DENTAL CARIES: FACTORS IN SUSCEPTIBILITY AND CURRENT METHODS OF CONTROL

Paul E. Boyle, D.M.D., Philadelphia

DENTAL caries presents a serious problem because of its almost universal occurrence and because of its sequelae. Untreated tooth decay almost without exception progresses to exposure of the dental pulp with infection of the soft tissues within the tooth and about its apex. Such pulp or periapical abscesses in rare instances may cause metastatic infection in other parts of the body such as the joints, endocardium, brain or kidney. A more subtle systemic effect from local infection within or about the teeth and other tissues has been claimed by proponents of the focal infection theory.[1] If this thesis is accepted, then dental infection must be recognized as one of the most serious of public health problems.

## Ancient Man

The significance of dental caries as an expression of degeneration of the human race has been stressed by anthropologists.[2] It is known that early man was relatively free of dental caries. Since the teeth are among the best preserved remains, a fairly accurate estimate may be made of the incidence, type and extent of tooth decay.[3-11]

In spite of variations in the material examined, the methods of examination and the ways in which the findings are recorded,[12] certain fairly uniform conclusions emerge from the mass of data concerning dental caries in ancient man.

1. The earliest known skulls contain teeth which are nearly or entirely free from dental caries.[6, 13] In this respect they resemble the teeth of lower animals and of present day tribes isolated from civilization. Exceptions to this general rule are the Rhodesian skull,[13] skulls of the Dolmen period[13] and the Nagysap skull.[6]

2. Caries was a disease of older individuals and was largely secondary to the wearing away of tooth structure followed by impaction of food. [4, 14]

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13. Krikos, Alex, The Progress of Decay in Greece from the Most Ancient Times Down to the Present. *Trans. Am. D. Soc. Europe:* 174, 1935.

14. Marston, A. T., The Teeth of Prehistoric Man. *Brit. D. J.* 61:619 (November) 1936.

3. The anterior teeth were almost entirely free from dental caries.[15] The upper anterior teeth were, however, more susceptible than the lower anterior teeth.[6]

4. Caries involving the deciduous teeth was rare[15-18] or completely absent.[19-21]

5. Associated with the low incidence of dental caries were large jaws with large, regularly spaced teeth in good occlusion and a high degree of development of the masticatory apparatus.[8, 22-24]

6. Males had somewhat fewer carious teeth than females of the same age.[6, 25-28]

7. Susceptibility to dental caries varied with geographic location.[3-5, 7, 28, 29]

8. Dolichocephalic skulls were relatively immune to caries as compared to brachycephalic skulls.[3, 6, 29]

9. An increase in caries followed an intermixture of races.[7, 13] This has been explained as caused in part by inheritance of tooth size from one parent stock and jaw size from another with resultant crowding of teeth and predisposition to caries[30, 31] and is supported by experimental results in dogs.[32, 33]

The importance of function in the development and maintenance of the teeth and jaws in primitive man has been stressed by a number of investigators.[8, 13, 34] There are, however, dissenting opinions.[9, 35]

Stein[36] has pointed out the importance of the high infant mortality among primitive peoples in eliminating individuals whose teeth might be susceptible to caries if they survived.

## Modern Primitives

The teeth of savages in various parts of the world have been found to be strikingly similar to those of early man in respect to caries susceptibility. Few of their teeth show evidence of decay.

There is an overwhelming amount of evidence indicating a marked increase in dental caries following contact of primitive peoples with civilization.[37-53]

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38. Staz, J., Dental Caries in South Africa. *S. African J. Med. Sci.* (Suppl.) 3:1-63 (May) 1938.
39. Laband, F., Two Years' Dental School Work in British North Borneo; Relation of Diet to Dental Caries Among Natives. *J.A.D.A.* 28:992 (June) 1941.
40. Restarski, J. S., Incidence of Dental Caries Among Pure-Blooded Samoans. *U. S. Naval Med. Bull.* 41:1713 (November) 1943.

An interesting corollary is that when groups of predominantly European stock become cut off from civilization and return to primitive methods of subsistence they may develop again a high degree of resistance to dental caries.[54-63]

Similar groups partially isolated from civilization but importing a significant part of their food supply have been found to have a high degree of susceptibility to caries. White flour and sugar usually constitute the major part of such food imports since they are transported and stored conveniently. A large part of the caloric intake therefore is of foods which are low in vitamins and minerals. The Pitcairn Islanders are one such group.[64, 65] Another group, in Newfoundland, had been described by Adamson[66] who reports that 61.4 per cent of 868 people examined had severe dental caries.

## Modern Civilized Peoples

Extensive surveys to determine the prevalence of dental caries in school children have been carried out in America,[67] England[68] and other countries. There is substantial agreement that caries attacks both deciduous and permanent teeth in the great majority of persons living under modern civilized conditions. Since caries leaves a permanent defect which is recognizable throughout the life of the tooth, whether repaired by a filling or left untreated, and since all but a negligible proportion of permanent teeth extracted during youth are lost because of the progress of caries, it is feasible to compute the entire caries experience of an individual, at least in the permanent teeth. Workers in the United States Public Health Service have proposed that the designation "decayed, missing and filled" be abbreviated to "DMF," to serve as a symbol for teeth or tooth surfaces which have been affected by caries.[69, 70] From

41. Ferguson, R. A., A Dental Survey of the School Children of American Samoa. *J.A.D.A.* 21:534 (March) 1934.
42. Kirkpatrick, R. M., Dental Caries and Odontoclasia in New Guinea. *Austral. D. J.* 7:707 (November) 1935.
43. Clawson, M. Don, The Shammar Bedouin Dental Survey. *D. Mag. & Oral Topics* 53:117 (February-March) 1936.
44. Campbell, T. D., and Gray, J. H., Observations on the Teeth of Australian Aborigines. *Austral. D. J.* 40:290 (August) 1936.
45. Steadman, F. St. J., The Teeth of the Australian Aborigines. *Proc. Roy. Soc. Med.* 33:29 (November) 1939.
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47. Agnew, R. G., Dental Caries Amongst Tibetans and Border Aborigines. *J. D. Res.* 20:251 (June) 1941.
48. Anderson, B. G., A Study of the Incidence of Dental Caries in 1,000 Chinese. *J. D. Res.* 12:709 (October) 1932.
49. Wright, H. B., A Frequent Variation of the Maxillary Central Incisors with Some Observations on Dental Caries Among the Jivaro (Shuara) Indians of Ecuador. *Am. J. Orthodont. & Oral Surg.* 27:249 (May) 1941.
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51. Hamlin, H., A Health Survey of the Seminole Indians. *Yale J. Biol. Med.* 6:155 (December) 1933.
52. Arnim, S. S.; Aberle, S. D., and Pitney, E. H., A Study of Dental Changes in a Group of Pueblo Indian Children. *J.A.D.A.* 24:478 (March) 1937.
53. Steggerda, Morris, and Hill, T. J., Incidence of Dental Caries Among Maya and Navajo Indians. *J. D. Res.* 15:233 (September) 1936.
54. Grabham, M. C., Where Teeth Do Not Decay. *D. Surg.* 20:635 (October) 1923.
55. Marshall, E. H., Report on a Visit to Tristan da Cunha. *Brit. D. J.* 47:1099 (October) 1926.
56. Sampson, W. E. A., Dental Examination of the Inhabitants of the Island of Tristan da Cunha. *Brit. D. J.* 53:397 (March) 1932.
57. Owen, E. F. D., Tristan da Cunha. A Visit to the Lonely Island. *Brit. M. J.* 1:173 (January) 1936.
58. Barnes, H. N. V., A Dental Examination of the Inhabitants of the Island of Tristan da Cunha. *Brit. D. J.* 63:86 (July) 1937.
59. Sognnaes, R. F., Recent Dental Study of the Inhabitants of Tristan da Cunha. *J. D. Res.* 18:243 (June) 1939.
60. Sognnaes, R. F., A Condition Suggestive of Threshold Dental Fluorosis Observed in Tristan da Cunha. I. Clinical Condition of the Teeth. *J. D. Res.* 20:303 (August) 1941.
61. Sognnaes, R. F., and Armstrong, W. D., A Condition Suggestive of Threshold Dental Fluorosis Observed in Tristan da Cunha. II. Fluorine Content of the Teeth. *J. D. Res.* 20:315 (August) 1941.
62. King, J. D., Dental Caries in Lewis and Parts of West Rossbire. *Lancet* 2:109 (July) 1938.
63. King, J. D., Dental Disease in the Island of Lewis. Medical Research Council Spec. Rep. Series, 241. London: His Majesty's Stationery Office, 1940, p. 63.
64. Bennett, Norman, A Survey of the Conditions Associated with Immunity and Susceptibility to Dental Caries. *Brit. D. J.* 66:193 (February) 1939.
65. Shapiro, H. L., Descendants of the Mutineers of the Bounty. *Mem. Bernice P. Bishop Mus.* 11: No. 1, 1929.
66. Adamson, J. D., and others, Medical Survey of Nutrition in Newfoundland. *Canad. M. A. J.* 52:227 (March) 1945.
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68. Medical Research Council, Reports of the Committee for the Investigation of Dental Disease. II. The Incidence of Dental Disease in Children. Spec. Rep. Series, 97. London: His Majesty's Stationery Office, 1925.
69. Klein, Henry, and Palmer, C. E., Dental Caries in American Indian Children. *Pub. Health Bull.* 239. Washington, D. C.: U. S. Govt. Printing Office, December, 1937.

an examination of more than 12,000 children, these workers[71-73] demonstrated that more than 95 per cent of the children had experienced caries of the permanent teeth by the age of 15, and that of the erupted permanent teeth about 15 per cent were decayed, missing or filled.

More than 90 per cent of all DMF surfaces in the permanent teeth are found in the molar teeth and in the upper central and lateral incisor teeth of school children. The lower incisors, cuspids and first bicuspids and the upper cuspids have the least susceptibility to caries, taking into account the length of exposure to the oral environment.[74, 75]

## Miscellaneous Factors

The fact that there is more caries in the teeth of girls than of boys of the same age[68, 76-78] has been accounted for, at least up to the age of 15, by the fact that the teeth of girls erupt earlier and, therefore, have been exposed to the oral environment for a longer period of time.[79]

The influence of race within the United States has been discussed by Klein,[71] who concluded that different racial groups show appreciably different degrees of resistance to dental caries.

It has been shown that the siblings of caries-immune children are about half as susceptible to caries as are the siblings of caries-susceptible children.[80]

On the other hand, it has been demonstrated that the economic status has little influence on the incidence of dental caries. The volume of dental care, however, increases considerably with increase in the community economic level; and it clearly has been shown that dental care is effective in lowering the rate of loss of teeth.[81]

The immunity to caries exhibited by some individuals and by particular groups of teeth or tooth surfaces is too complex and too inadequately understood for discussion in this article. Suffice it to say that developmental grooves and fissures and interproximal and cervical surfaces that are not cleansed readily by the action of muscles and by the excursion of food are the usual sites of the initiation of caries.

## Dietary Influence

The chemical composition of the saliva and the acidogenic, enzymatic and plaque-forming properties of the bacterial flora have been investigated by many research workers. The restriction of carbohydrates, particularly sugars, in the diet of caries-susceptible individuals has been shown by Bunting and his coworkers[82] to be effective in reducing the numbers of lactobacilli in the saliva and in lessening the incidence of new cavities.

70. Klein, Henry; Palmer, C. E., and Knutson, J. W., Studies on Dental Caries. I. Dental Status and Dental Needs of Elementary School Children. *Pub. Health Rep.* 53:751 (May) 1938.

71. Klein, Henry, and Palmer, C. E., The Dental Problem of Elementary School Children. *Milbank Mem. Fund Quart.* 16:267 (July) 1938.

72. Klein, Henry, and Palmer, C. E., Studies on Dental Caries. IX. The Prevalence and Incidence of Dental Caries Experience, Dental Care and Carious Defects Requiring Treatment in High School Children. *Pub. Health Rep.* 55:1258 (July) 1940.

73. Sloman, E. G., and Sharp, J. B., Extent of Dental Caries and Condition of Teeth of San Francisco High School Students. *J. Calif. D. A.* 16:89 (May-June) 1940.

74. Knutson, J. W.; Klein, Henry, and Palmer, C. E., Studies on Dental Caries. VIII. Relative Incidence of Caries in the Different Permanent Teeth. *J.A.D.A.* 25:1923 (December) 1938.

75. Klein, Henry, and Palmer, C. E., Studies on Dental Caries. XII. Comparison of the Caries Susceptibility of the Various Morphological Types of Permanent Teeth. *J. D. Res.* 20:203 (June) 1941.

76. Broughton-Head, L. C., The Influence of Sex and Environment in Relation to Dental Caries and Dentition. *Brit. D. J.* 27:913 (October) 1906.

77. Munblatt, M. A., A Critical Study of the Incidence of Dental Caries in Children. *D. Cosmos* 75:592 (June) 1933.

78. Stoughton, A. L., and Meaker, V. T., Sex Differences in the Prevalence of Dental Caries; Based on 19,435 Oral Examinations by Dental Personnel in Georgia, Illinois, Missouri and Hagerstown, Md. *Pub. Health Rep.* 47:96 (January) 1932.

79. Klein, Henry, and Palmer, C. E., Studies on Dental Caries. VII. Sex Differences in Dental Caries Experience of Elementary School Children. *Pub. Health Rep.* 53:1685 (September) 1938.

80. Klein, Henry, and Palmer, C. E., Studies on Dental Caries. V. Familial Resemblance in the Caries Experience of Siblings. *Pub. Health Rep.* 53:1353 (August) 1938.

81. Klein, Henry, and Palmer, C. E., Community Economic Status and the Dental Problem of School Children. *Pub. Health Rep.* 55:187 (February) 1940.

82. Bunting, R. W.; Jay, Philip, and Hard, D. G., A Report of the Successful Control of Dental Caries in Three Public Institutions. *J.A.D.A.* 18:672 (April) 1931.

Cox and others[12] have set forth experimental evidence that a high sugar content in the diet accelerates the rate of caries progress although it does not initiate caries in the albino rat. Schweigert and co-workers[83, 84] have demonstrated that in the cotton rat the number and size of cavities are related to ingestion of sugar and carbohydrates.

The effect of diet, and particularly of vitamin D, on tooth structure has a voluminous literature in which the work of Mellanby and co-workers[85] is outstanding. It has been established clearly that lack of vitamin D during the period of tooth formation adversely affects tooth structure. The relation of vitamin D intake to the incidence and rate of progress of caries is less clear.

Boyd and his group[86] believe that an adequate diet with or without excess sugar reduces the rate of progress of dental caries in children. The mechanisms by which this effect is accomplished are not clear.

## Action of Fluorine

Finally we come to the story of dental fluorosis.[87] In brief, fluorine has been shown to be the cause of mottled enamel, a condition endemic in many parts of the world, including the United States. Drinking water containing more than 1 part per million of fluorine causes disfiguring defects in the enamel of forming teeth. The water supply has been changed in certain communities to prevent this.

Mottled enamel is brittle and has a more irregular surface than nonmottled enamel. In spite of this it is relatively immune to dental caries. Drinking water containing 1 p.p.m. of fluorine has been found to have little if any deleterious effect on forming enamel but increases the resistance to dental caries. Children who have ingested such waters from birth have significantly less caries experience than otherwise comparable groups drinking water low in fluorine content. The reduction in caries is particularly striking in the anterior teeth.[88, 89] On the basis of such findings, several communities in the United States and in Canada have added 1 p.p.m. of fluorine to the municipal drinking water.

The effectiveness of topically applied fluorides in reducing the incidence of dental caries also has been shown clearly. The reduction in treated quadrants of the mouth, using untreated quadrants of the same mouth as a control, is more than 40 per cent.[90-93] Thus it seems clear that relatively effective means of control of dental caries are at hand.

## Suggested Reading

The interest manifested in all factors pertaining to dental caries and its prevention and control is evidenced by the quantity and quality of articles published on the subject in recent years. A few of the more recent articles are listed here:

83. Schweigert, B. S.; Shaw, J. H.; Zepplin, Marie, and Elvehjem, C. A., Dental Caries in the Cotton Rat. VI. The Effect of the Amount of Protein, Fat and Carbohydrate in the Diet of the Incidence and Extent of Carious Lesions. *J. Nutrition* 31:439 (April) 1946.

84. Schweigert, B. S.; Shaw, J. H.; Phillips, P. H., and Elvehjem, C. A., Dental Caries in the Cotton Rat. III. Effect of Different Dietary Carbohydrates on the Incidence and Extent of Dental Caries. *J. Nutrition* 29:405 (June) 1945.

85. Mellanby, May, Diet and the Teeth: An Experimental Study. III. The Effect of Diet on Dental Structures and Disease in Man. Medical Research Council Spec. Rep. Series, 191. London: His Majesty's Stationery Office, 1934.

86. Boyd, J. D., and Drain, C. L., The Arrest of Dental Caries. *Am. J. Dis. Child.* 44:691 (September) 1932.

87. *Fluorine and Dental Health.* Washington, D. C.: American Association for the Advancement of Science, Publ. 19, 1942.

88. Dean, H. T., Endemic Fluorosis and Its Relation to Dental Caries. *Pub. Health Rep.* 53:1443 (August) 1938.

89. Dean, H. T.; Arnold, F. A., Jr., and Elvove, Elias, Domestic Water and Dental Caries. *Pub. Health Rep.* 57:1155 (August) 1942.

90. Bibby, B. G., Preliminary Report on the Use of Sodium Fluoride Applications in Caries Prophylaxis. *J. D. Res.* 21:314 (June) 1942.

91. Cheyne, V. D., Human Dental Caries and Topically Applied Fluorine: A Preliminary Report. *J.A.D.A.* 29:804 (May) 1942.

92. Bibby, B. G., Use of Fluorine in the Prevention of Dental Caries. *J.A.D.A.* 31:228 (February) 1944.

93. Knutson, J. W., and Armstrong, W. D., Effect of Topically Applied Sodium Fluoride on Dental Caries Experience. II. Report of Findings for Second Study Year. *Pub. Health Rep.* 60:1085 (September) 1945.

Albrecht, W. W., Climate, Soil and Health. II. Managing Health via the Soil. *Oral Surg., Oral Med. & Oral Path.* 1:206 (Feb.) 1948.

Cox, G. J., and others, Effect of Carbohydrates on Experimental Caries in the Rat. *J. D. Res.* 27:562 (Oct.) 1948.

Easlick, K. A. (editor), *Dental Caries, Mechanism and Present Control Technics as Evaluated at the University of Michigan Workshop.* St. Louis: C. V. Mosby Company, 1948.

Gruebbel, A. O., Effectiveness of Methods for the Control of Dental Caries, *J.A.D.A.* 37:391 (Oct.) 1948.

Hadjimarkos, D. M., and Storvick, C. A., Incidence of Dental Caries Among Freshman Students at Oregon State College. *J. D. Res.* 27:299 (June) 1948.

Keyes, P. H., Dental Caries in the Syrian Hamster. III. Effect of Gonadectomy on Caries Activity and Body Growth. (Lord Chaim prize award paper.) *New York J. Den.* 18:172 (May) 1948.

Kitchin, P. C., and Permar, Dorothy, Results of a Three Year Study of the Effectiveness of Carbohydrate Restriction in Reducing Salivary Lactobacillus Counts. *J. D. Res.* 27:316 (June) 1948.

Knowles, Eleanor, Survey of the Dental Condition of Children in Day and Residential Wartime Nurseries. *Brit. D. J.* 84:119 (March) 1948.

McLaren, H. R., Study of the Dental Caries Experience in Children of School Age. *J. Canad. D. A.* 14:466 (Sept.) 1948.

McClure, F. J., Fluorine in Dentin and Enamel of Sound and Carious Human Teeth. *J. D. Res.* 27:287 (June) 1948.

Philips, R. W., and Swartz, Marjorie, Effect of Fluorides on Hardness of Tooth Enamel. *J.A.D.A.* 37:1 (July) 1948.

Sognnaes, R. F., Caries-conducive Effect of a Purified Diet When Fed to Rodents During Tooth Development. *J.A.D.A.* 37:676 (Dec.) 1948.

Stephan, R. M., Relative Importance of Polysaccharides, Disaccharides and Monosaccharides in the Production of Caries. *J.A.D.A.* 37:530 (Nov.) 1948.

Van Huysen, G., and Muhler, J. C., Enamel Solubility Reducing Effect of Flavored Low Concentration Stannous Fluoride Solution. *J. D. Res.* 27:46 (Feb.) 1948.

## Summary

Experimental and clinical evidence compiled by many workers indicates that:

1. Dental caries is a disease of civilization, presumably a sign of degeneration of the race.

2. Dental fillings do not affect the initiation of caries but are effective in prolonging the life expectancy of teeth which are attacked.

3. Reduction of sugars and other carbohydrates in the diet lowers the rate of incidence and the rate of progress of tooth decay.

4. Children who are exposed to fluorine in small amounts, usually in drinking water, while the teeth are forming have a lower incidence of caries than otherwise comparable children whose fluorine intake is minimal.

5. Topical application of fluorine to erupted teeth lowers the incidence of caries by at least 40 per cent.

# HOSPITAL ROUTINE IN ORAL SURGERY

Robert A. Atterbury, D.D.S., Oak Park, Ill.

The literature on oral surgery has covered in detail the surgical technics, but little has been written on the many nonsurgical procedures that are involved when a patient is hospitalized for oral surgical treatment. The dental profession, as a whole, has ignored for many years this most important phase of dental service.

Dental care is a necessary part of the treatment of many medical and surgical patients, and cooperation between medicine and dentistry is imperative in modern hospital organizations. The pinnacle of evolution has not been reached by a hospital if it does not include a well organized dental service. However, this pinnacle is gradually being approached through necessity during this era of rapid advances in medicine and dentistry. The need has been such a pressing one that medical schools, dental schools and hospitals empowered the American Hospital Association and the American Dental Association to formulate a standard plan of organization and procedure for dental departments in approved hospitals. This plan was formulated and published in a report by the Committee on Hospital Dental Service.[1] The American College of Surgeons has approved the plan in essence by adding a "Minimum Standard for Dental Departments in Hospitals (No. 16)" to their program for hospital standardization.

The installation of adequate and approved dental departments in the hospitals is in the process of development. This phase of the program is a serious problem and rests squarely on the shoulders of the dental profession.

Most dental schools are including hospital procedure in the curriculum. Students should have the benefits of a dental school-hospital relation.[2] Some of them will become dental staff members of their community hospital and as such will be entitled to the privileges of that hospital. Dentists who "know their way around" in hospitals promote mutual respect between the medical and the dental profession with the result that there is closer cooperation between the two groups.

Staff organizations are classified as open or closed (restricted). In the open staff, physicians, dentists and surgeons who do not hold definite staff appointments are admitted to practice in the hospital as members of the associate or courtesy staff. In the closed staff, only those who hold regular staff appointments may serve patients in the hospital. Both types of organization are generally recognized, and local conditions will usually indicate which is most desirable.

Dentists who do not hold a hospital staff appointment but who desire to admit a patient to the hospital for oral surgical treatment should make arrangements with the chief dental surgeon for admission, operating room privileges and so on.

Hospital Dental Clinic, Research and Educational Hospital, University of Illinois.

1. Committee on Hospital Dental Service, American Dental Association, Basic Standards of Hospital Dental Service Required of Approved Hospitals. *J.A.D.A.* 33:1332 (Oct.) 1946.

2. Archer, W. H., *Teaching Relationships Between Dental School and Hospitals.* American Association of Dental Schools. 1944, pp. 152-163.

### Routine of Admission

The patient should enter the hospital on the day preceding the operation. Most hospitals require that patients be admitted 24 hours prior to an operation.

There are many factors involved in admitting the patient. The admitting diagnosis of the private patient may already have been made. The diagnosis of the free patient is usually made by the outpatient dental department or a member of the dental staff.

The admitting room controls the admission, routing and discharge procedures. The system is more elaborate in some hospitals than in others. Typical admission procedures are presented graphically in Figure 1. The admitting service provides for the patient's history, a general examination and such detailed examination as may be necessary to arrive at a working diagnosis. The admitting clinic sheet is completed and the patient is assigned to the appropriate dental service for treatment.

### Outpatient Routine

If on an outpatient basis, the patient is referred to the assigned service, where detailed examination is made and treatment begun. Should the dental department require examination by any of the other services, this request on a consultation form becomes part of the patient's record.

### Inpatient Routine

When the patient is admitted either on a direct hospital admission or from the outpatient service, he is sent to the ward where the nurse's record and the clinical record (also kept by the nurse) are added. The nurse's record usually forms a rather bulky section of the hospital chart, but all authorities agree that its value as a part of the complete record justifies its bulk.

There are many variations of the important graphic or clinical record (TPR record). A typical one is divided horizontally into five sections; three of them are for graphic records of temperature, pulse and respiration, one is for a record of the fluid intake and fluid output, including a record of stools, vomitus and urine, and the remaining section is for a record of medication. The sections are divided vertically into days and smaller units of time. Usually important occurrences, such as operation and hemorrhage, are written above the 104 degree temperature line, with reserve of course, as too many entries will result in a crowded, illegible chart.

### Preoperative Study of the Patient

When routine nursing procedures have been completed, the nurse notifies the dental intern on call. The history and physical examination are completed by the intern and recorded on the proper sheets. Routine laboratory examinations are performed and any special tests and examinations are instituted when indicated. Consultations with other departments are sought by the intern, insofar as they are indicated. The purpose of this study is to establish, as accurately as possible, a preoperative diagnosis. This is especially true if the signs and symptoms are indefinite.[3] The following basic condensed history outline is suggested for reference during history taking:

1. Chief complaint.
2. Present illness (onset, course, treatment, constitutional symptoms).
3. Past history (general health, previous disease, trauma, operations, hospitalization, allergic history).
4. Systemic review (including marital history and personal habits).
5. Family and social history.

### Hospital Records

All hospital records should be set down in clear, legible handwriting. Where pos-

3. Dingman, R. O., and Hayward, J. R., The Value of Writing Case Histories. *J.O.S.* 5:123 (April) 1947.

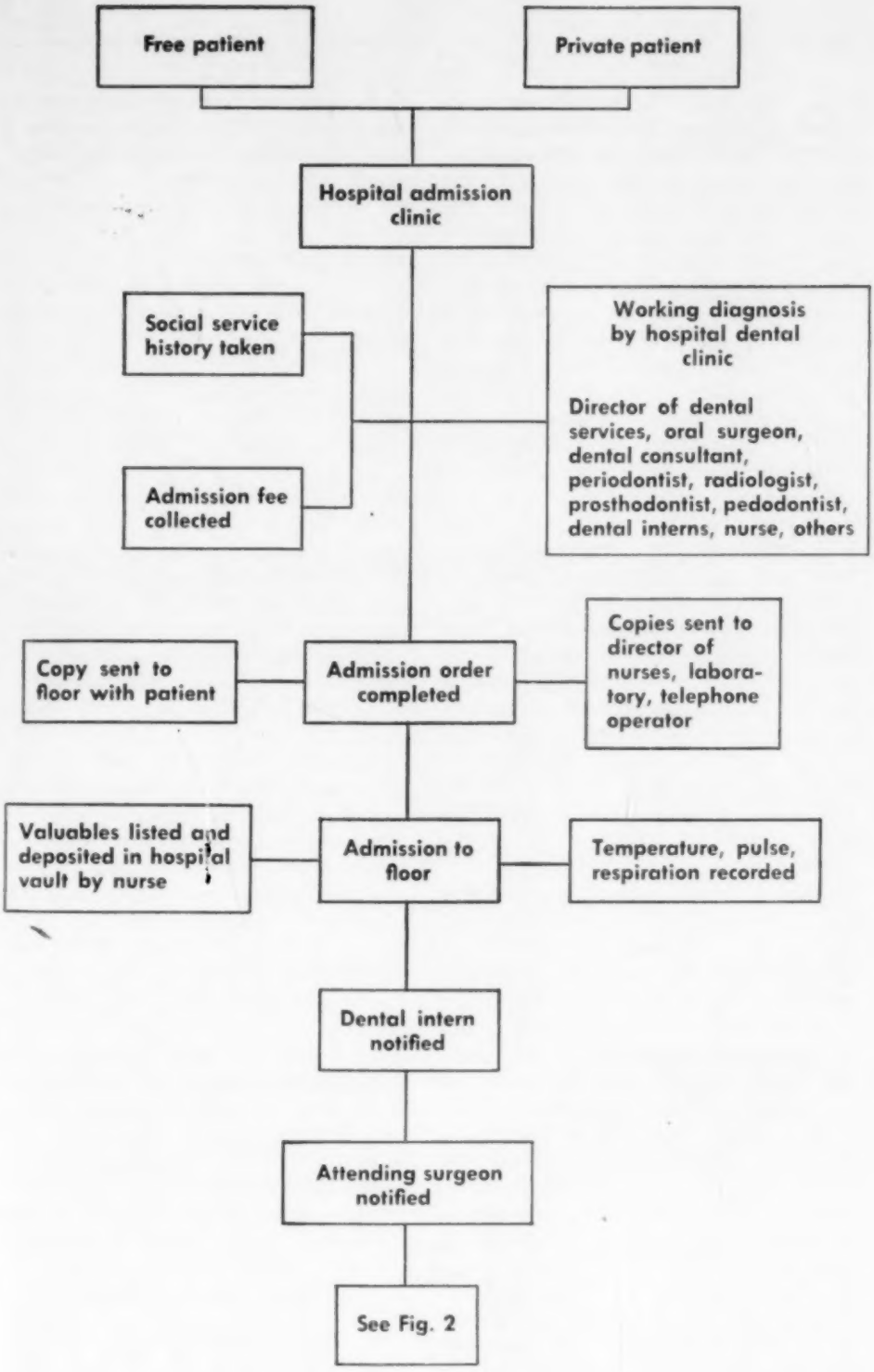
Free patient
Private patient
Hospital admission clinic
Social service history taken
Admission fee collected
Working diagnosis by hospital dental clinic
Director of dental services, oral surgeon, dental consultant, periodontist, radiologist, prosthodontist, pedodontist, dental interns, nurse, others
Copy sent to floor with patient
Admission order completed
Copies sent to director of nurses, laboratory, telephone operator
Valuables listed and deposited in hospital vault by nurse
Admission to floor
Temperature, pulse, respiration recorded
Dental intern notified
Attending surgeon notified
See Fig. 2

Fig. 1.—Hospital admission procedure for oral surgical patient

sible they should be supplemented by drawings, photographs and possibly prints of the roentgenograms. Photographs, charts and diagrams add much to the interest and effectiveness of a report and supply accurate data by which progress can be ascertained. Also, careful recording of history, clinical notes and operative notes makes it possible to review cases and results accurately, no matter how much time has elapsed. Illegible clinical notes are nearly useless should another surgeon take over the case for any reason. Therefore, all clinical records should be clear and plainly written, complete, continuous and coordinated.

The hospital chart usually includes the following sheets: treatment record, progress notes, operative record, anesthesia record and a clinical summary (completed just prior to discharge). Extra departmental sheets are added as the patient is seen on consultation, such as surgical, otorhinolaryngologic ophthalmologic, medical, orthopedic, tumor, neurologic and dermatologic. Other sheets which help to complete the chart are the laboratory, pathologic and roentgen diagnostic records.

*Treatment Record.*—On the treatment record the surgeon writes any orders pertaining to the patient. The sheet is divided into two sections, the right for diet and the left for medication. Columns are provided for recording the date begun and the date discontinued. Some hospitals require that prescriptions be copied in full in the medication column and the pharmacy number entered when received. Orders for diet should specify full, light or soft. Special diets are copied in full in the diet column. This sheet, especially in a long continued case, is of inestimable value.

*Progress Notes.*—The progress sheet contains the condition of the patient day by day. On it the surgeon records complications, consultations, preoperative diagnosis, operative diagnosis, change in diagnosis, change in service, instructions to patient, discharge diagnosis and condition on discharge. These notes are written as frequently as the type of case may indicate. They are dated and it is also wise to mark down the hour when making the note. At the time of discharge a final progress note is made. This should describe the patient's general condition and the part treated, prognosis as affected by his daily surroundings, home instructions given to the patient and instructions for follow-up treatment if indicated.

*Operative Record.*—The operative record should include the preoperative diagnosis. It is a detailed report of the operation showing what was found, what was done and final conclusions or a postoperative diagnosis. This report should be completed by the surgeon immediately after the operation. The anesthetist should not be asked to complete an operative record.

*Anesthesia Record.*—The anesthesia record is completed by the anesthetist, who records his own examination of the patient prior to the operation. On the front of the sheet he records events as they occur during and immediately after the operation. The sheet is returned to the floor with the patient and final entries are inserted concerning the postanesthetic condition of the patient.

*Legal Consent.*—Legal consent to operation, in writing, should be made a part of the hospital chart. A personal signature is required from a responsible adult. If the patient is irresponsible or unconscious, the consent may be signed by the nearest relative. A legal guardian's signature is necessary if the patient is a child.

## Preoperative Orders

The orders will vary depending on the surgeon, type of patient, operation contemplated, hospital and type of anesthe-

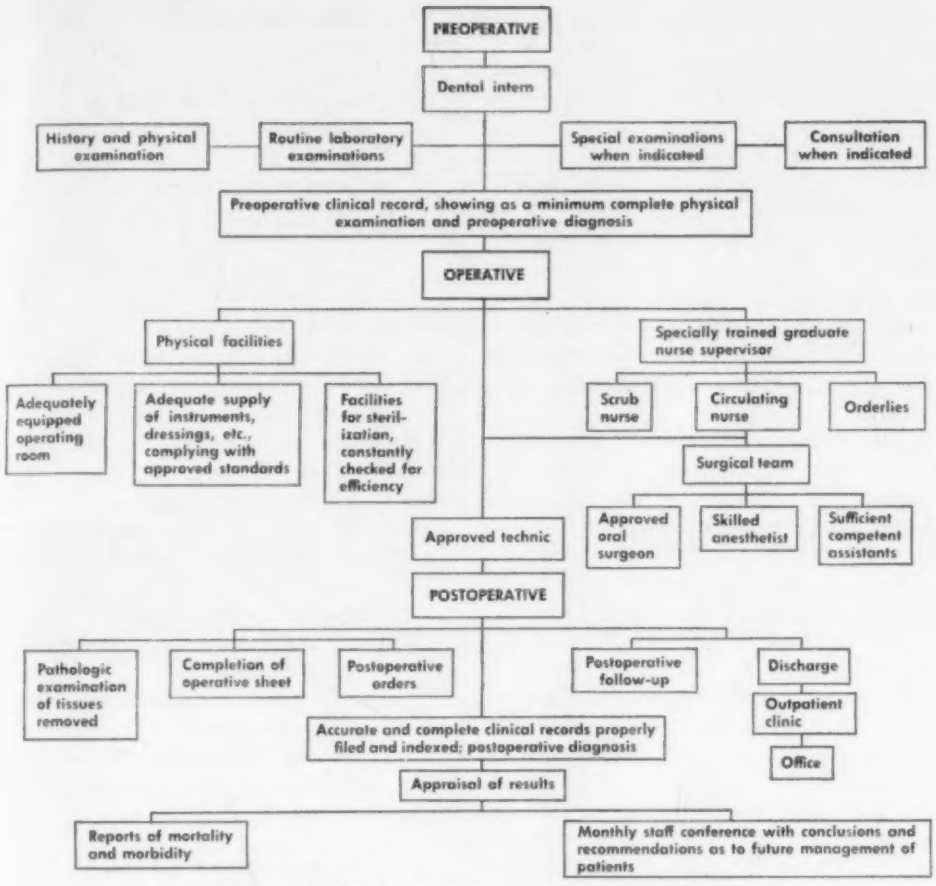


Fig. 2.—Preoperative, operative and postoperative relationship

sia. Basically the orders should include some, if not all, of the following:

1. For oral surgery (date) at (time).
2. Type of anesthesia.
3. History and physical examination.
4. Complete differential blood count.
5. Bleeding and coagulation time.
6. Urinalysis.
7. Sedation at bedtime (night before operation).
8. Enema (night before operation).
9. Withhold breakfast.
10. Bladder empty before operation.
11. Roentgenograms to surgery with patient.
12. Remove any oral appliances.
13. Preoperative medication with sulfonamides or penicillin.
14. Preanesthetic medication.
    Morphine sulfate, (dosage), "H" at (time).
    Atropine sulfate, (dosage), half an hour before operation.
15. Narcotic number.
16. Signature.

## Day of Operation

The details of the nonoperative treatment and records have been discussed. Before the operation is performed, the record should establish the diagnosis and

also show the general condition of the patient.

The surgeon should examine the patient's hospital chart the morning of the operation and ascertain the laboratory and physical findings. The patient should be seen before the preanesthetic medication has been administered, in order to determine whether or not the patient has eliminated all of the barbiturate ordered the night before. If the patient appears dizzy and feels groggy, he may have failed to detoxify the evening barbiturate. Anesthesia is contraindicated until liver damage is ruled out.

If there are no contraindications, and the correlated findings are complete, the surgeon may proceed to the operating room. The instrument set-up, suction apparatus, lighting and so on should be checked to make certain that all is in readiness before the scrubbing ritual.[4]

A patient should never arrive at the operating room without a record of a complete examination and preoperative study. Most hospitals have a ruling that if the hospital record does not accompany the patient, he is returned to the ward. Of course, in extreme emergencies which may prove fatal to the patient, the surgeon may so state, and later be responsible to the staff for justification of his actions.

Typical relations between preoperative, operative and postoperative details as applied to oral surgery are shown in Figure 2.

The operative record of the surgical details is completed after the operation has been performed. This may be written by the assistant or by the surgeon himself. Before leaving the hospital the surgeon should again visit the patient and ascertain his condition.

### Postoperative Orders

The postoperative orders, of course, depend on the type of operation, length of operation, type of anesthesia, fluids lost, condition of patient and various other factors. Basically they cover the following points:

1. Medication for pain:
   Morphine sulfate, (dosage)
   or codeine sulfate, (dosage).
2. Fluids ad lib. post pausea.
3. Bed position (prone, lateral, semi-Fowler's, exaggerated Fowler's, Trendelenburg).
4. Type of diet (liquid, soft, soft bland, general).
5. Bed rest (how long) or
6. Bed rest with bathroom privileges.
7. Cold applications or irrigations to operative site.
8. If sutures were inserted, date they should be removed.
9. Penicillin (if required).
10. Sulfonamide (if required).
11. If on sulfonamide routine:
    white blood count
    blood sulfa level daily
    urinalysis daily for sulfa crystals and hematuria
    force fluids (oral, subcutaneous, intravenous)
    measure fluid intake and output.
12. Ascorbic acid, 100 mg. before meals.
13. Signature.

### Postoperative Follow-up

The surgeon is responsible for the patient's care after the operation. He must continue to supervise and direct treatment until the patient is ready for discharge. The final diagnosis is then recorded by the attending surgeon, who should also ascertain and accurately record the patient's condition at the time of discharge.

### Discharge

On discharge the patient may be transferred to the outpatient dental department, he may be seen at the oral sur-

4. Atterbury, R. A., Operating Room Technic for Oral Surgical Treatment. *J.A.D.A.* 35:706 (Nov. 15) 1947.

geon's office or he may be referred to his own dentist. In any case the patient should be kept under periodic observation. When he is discharged, an abstract of the case is recorded on a clinical summary sheet.

In order to determine end results more accurately a systemic follow-up for six months or longer should be maintained on all interesting and teaching cases. Certain cases should, of course, come under review at the regular staff conference, where diagnosis, treatment and progress, both clinical and roentgenographic, may be discussed. In this manner the efficiency of the management of oral surgical patients may be increased. The dental personnel of the hospital as well as the medical personnel will gain valuable information, which benefits both, and ultimately the public that they serve.—*1011 Lake Street.*

## ANALYSIS OF THE UNSTABLE AND ILL-FITTING ARTIFICIAL DENTURE

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THE main purpose of this article is to acquaint the general practitioner with some of the reasons and remedies for instability of full dentures. All shortcomings in the stability and the fit of a denture may be directly attributed to (1) overextension of denture margins, (2) underextension of denture margins, (3) pressure areas, (4) void areas, (5) faulty tooth placement, (6) inaccurate jaw relation records and faulty occlusion, (7) anatomic and physiologic shortcomings of the jaws or (8) faulty laboratory procedures.

The "denture treatment" procedures suggested here imply that some dentures easily and quickly may be made more satisfactory by simply cutting, trimming and relieving the denture base material in suitable locations. The suggested "impression treatment" procedures will acquaint the practitioner with the details that should be observed in future denture construction.

### Overextension of Upper Denture

*Posterior Border.*—The patient complains, "The denture is too long—I can't talk or swallow!" The palatal muscles present dislodging forces as the soft palate functions involuntarily when stimulated by the velum-encroaching denture border. The denture border should be shortened so as to give the palatal muscles sufficient clearance for function.

*Pterygomaxillary Notch.*—If there is overextension in this region the patient complains first of soreness and then of loosening of the denture. The denture is easily dislodged because the patient, favoring the traumatized tissue, does not permit complete seating of the denture. The denture border should be trimmed so that there is no excess material in the rather limited space of the pterygomaxillary notch. The denture border should not terminate on the posterior slope of

the tuberosity, nor should it encroach on the hamulus.

*Buccal Space.*—Here the denture border might be too thick and also excessively long. In some mouths such a thick, overextended margin will collide with the coronoid process of the mandible, which moves downward and forward when the mandible is depressed.

In taking the upper impression it is advisable to have the jaws slightly apart so that the mandible may be swung from side to side to allow sufficient clearance for the coronoid process. The height and width of the border are reduced by trimming the base material from the border and the adjacent area. Although the border itself must be reproduced, the operator should use judgment in waxing up the adjacent area prior to flasking the denture.

In some instances, if there is no sign of interference with the coronoid process, the denture border may occupy the entire buccal space without discomfort to the patient. He readily learns to employ the border as a "handle" to be gripped by the cheek muscle as it sweeps around the denture flange. Such a denture is not easily dislodged unless it is voluntarily released by the patient.

*Labial Borders.*—Overextension in this region bruises the reflected mucosa, which in turn prevents firm seating of the denture. If the impression technic completely reproduces the reflected tissues, it is advisable to reduce the height of the border about 0.5 mm. within two weeks after initial delivery of the denture. The increase in stability and retention is immediately apparent to both patient and practitioner.

### Overextension of Lower Denture

*Heels.*—The extreme posterior margin comprises the heel of the lower denture. If the margin extends beyond the retromolar pad and onto the pterygomandibular ligament, trauma of the ligament will result. The patient complains of pain, excessive fullness in the posterior part of the jaw and loosening of the denture when the jaw is depressed. The patient's remark that "There are too many teeth in the back!" is usually a cardinal symptom of an overextended heel or heels.

Treatment lies in the judicious trimming of the heel of the finished denture to prevent it from encroaching on the ligament.

*Posterior Buccal Margin.*—When the extreme posterior buccal margin of the denture is overextended, the patient complains of bruising of the buccal mucosa. The offending border can be felt by the operator when he places his fingers on the outside of the cheek. The traumatized tissue can be easily detected as a strip of inflamed tissue about 2 mm. wide, paralleling the denture border on the inside of the cheek. Gross overextension in this area will be a dislodging force. Fortunately, the buccinator muscle usually can tolerate varied amounts of overextension provided that the masseter muscle is not in too forceful approximation with it.

Accurate preparation of the impression tray is mandatory so that the extreme posterior buccal border of the finished denture will slip gently beneath the buccinator muscle when the mandible is moderately depressed.

Alternate treatment consists of judicious filing of the denture border with the patient's sense of comfort dictating the amount of base material to be removed.

*Midbuccal Margin (Molar Areas).*—When the buccal pouch is overfilled with a denture border, the patient complains of excessive fullness in the cheeks. Furthermore, the denture does not easily seat itself. The paramount reason for instability is that overextension in this area lessens the effectiveness of the buccinator muscle

and its hold on the posterior buccal margin.

The denture border should be trimmed until the base is comfortably enfolded by the buccinator muscle when the jaw is moderately depressed.

*Labial Flange.*—Overextension of a labial flange will seldom be the main cause of denture instability but it can be a contributing factor. Such a margin will traumatize the labial frenum and an overly thick flange will not be comfortably accommodated by the orbicularis oris. These two factors contribute to the instability of the denture.

The overextension should be reduced by trimming with a vulcanite bur. The polished surface of the labial flange of the denture is flattened with a vulcanite bur.

*Posterior Lingual Margin.*—Overextension in this region prevents the denture border from lying comfortably in the posterior lingual pouch formed by the superior constrictor, mylohyoid, palatoglossus and styloglossus muscles. Extraordinary movements of the tongue will easily dislodge the denture.

Judicious trimming of the denture will permit the tissues of the lingual pouch to drape themselves comfortably around the denture border.

*Lingual Frenum Border.*—Overextension in this area will bruise the tissues of the frenum region or irritate the sublingual carunculae. Such overextension naturally prevents good adaptation of the denture.

The denture should be accurately trimmed so that it will allow free play of the lingual frenum and does not cover the sublingual carunculae.

### Instability Due to Underextension

Many full upper dentures and most lower dentures are underextended. Underextension of upper dentures can almost always be controlled by rerimming an upper shellac baseplate tray with medium-fusing modeling compound prior to taking the final correction impression. An excellent preventive of underextension of lower dentures is the accurate fitting of a vulcanite tray directly to the mandible before proceeding with the correction phases of the impression.

### Underextension of Upper Denture

*Posterior Border.*—When the posterior margin terminates too far anteriorly, the denture edge rests on the comparatively unyielding, fixed tissue of the hard palate rather than on the soft, yielding tissues of the post-dam zone, and the denture tips out as any force is brought to bear on the incisors. The correct posterior termination of the denture is obtained by the location of the "ah" line in the immediate vicinity of the foveae palatinae.

*Pterygomaxillary Notch.*—Underextension in this region causes the denture margin to terminate on the posterior slope of the maxillary tuberosity. Naturally, valve seal is lost because the denture edge does not contact the softer tissues of the pterygomaxillary notch. In my practice I have seen three patients who were wearing upper dentures that stopped completely short of both tuberosities. The notch should be located by palpation with the edge of a small mouth mirror and a transfer by means of indelible lead is made from the mucosa to the impression tray.

*Buccal Space.*—Underextension of the buccal margin nullifies the grip of the buccinator muscle on the border and the flange of the denture, resulting in a comparatively unstable denture. The denture edge should extend the height of the space in order to assure comfort to the patient. Treatment lies in an accurate rerimming of the final impression tray with modeling compound.

***Buccal and Labial Margins.***—Underextension in these regions lessens the utility of the soft reflected tissues in the retention of the denture. In addition, full advantage is not taken of the stabilizing influence of the buccinator and orbicularis muscles.

Medium-fusing modeling compound is employed to rerim the impression tray. Prior to chilling the addition in the mouth, the cheeks and lip are drawn down gently to establish a definite border height.

### Underextension of Lower Denture

Accurate treatment of the heels of lower dentures is the important problem in their construction. Underextension of the heels of a lower denture, including the extreme posterior buccal and posterior lingual margins, causes unstability for these reasons:

1. The greater portion of the retromolar pad is not used as a post-dam zone when it might well be.

2. Buccally, the denture margin does not lie against the forward border of the ramus. This shortcoming obviously prevents the ramus from serving as an antiskid device.

3. Buccally, the underextended denture heel does not slip beneath the buccinator muscle, a failure which detracts greatly from the stability of a lower denture.

4. Buccally, the underextended denture heel does not occupy the full extent of the buccal shelf, that hard layer of bone extending from the crest of the residual ridge down to the external oblique line. This buccal shelf should be employed as a primary stress bearing area because it lies at right angles to the forces of mastication and is less subject to change than other bony parts of the maxilla or mandible. When a denture occupies the full extent of the buccal shelf, it possesses a definite seat to which it can return repeatedly, even long after the remainder of the lower residual ridge has undergone extensive changes.

5. Lingually, the underextended margin of the heel fails to enter the posterior lingual pouch formed by the mylohyoid, superior constrictor, styloglossus and palatoglossus muscles. The pouch can be a most useful adjunct to lower denture stability, but if underextension gives it nothing to grasp, its potentialities are lost. The remedy lies in prevention.

### Pressure Areas, Upper Denture

A denture whose impression surface excessively deforms the mucosa in various localized areas of the maxilla and mandible contributes to its own instability by causing trauma of the tissues or by diminishing adhesion in adjacent areas.

***Torus Palatinus.***—This overgrowth of bony tissue in the center of the hard palate contributes to the instability of the denture by acting as a fulcrum for undesirable leverage.

Central relief of the hard palate has been overemphasized, especially by technicians who have not received proper instruction from dentists. Mouths that are of uniform texture throughout the vault require no central relief.

When relief is necessary the stone model may be built up with air chamber metal of about 19 gage. Another method is to outline the entire hard area in the mouth with a soft indelible pencil, transfer the outline directly to the impression and then relieve the impression with a Kingsley No. 4 vulcanite scraper. The relief must be scraped judiciously because the completed denture should be in light contact with the torus when the denture is in position.

***Post Dam.***—Many operators believe that a thick post dam is the solution to almost all shortcomings of an upper denture. Clinical experience, however, does not bear this out. An exaggerated post dam

on the posterior margin of the denture may be the direct cause of its instability.

If the post dam is too wide, its pressure on the soft tissues of the palate may cause a reverse pressure, thus loosening the denture. If the post dam is too deep, bruising, atrophy and inadequate functioning of the post dam follow in close order.

An excessive depth of post dam is at best but a temporary expedient to give relief to various other hard-to-locate pressure areas. When the denture settles, the pressure areas become emphasized, thereby nullifying the initial advantages of the too prominent post dam.

The post dam tissues are located, using palpation, the "ah" line and the fovea palatinae as guides. A thin layer of impression wax is painted on the impression and adapted in the mouth under firm pressure. As an additional safeguard, about 1 mm. is scraped from the trough in the stone model formed by the impression wax post dam. Any individual pressure areas that prevent the denture from going to place are suitably relieved.

### Pressure Areas, Lower Denture

*Retromolar Pad.*—Although a moderate post dam on the posterior portion of the retromolar pad is desirable for stability of a lower denture, excessive pressure on the pad and surrounding structures is to be avoided. If the retromolar pad is pendulous and contains many fibers of loose connective tissue, it is apt to become sore and inflamed with every movement of the lower denture, which then becomes difficult to seat properly.

When this condition is encountered, the posterior occlusion should be relieved by completely grinding off all cusps and grooves of the upper second molar so that there will be no heavy bearing on the retromolar pads in centric occlusion. Omission of the upper second molars is often helpful. The denture may be carefully relieved by removing base material in the vicinity of the pads with a vulcanite bur.

*Torus Mandibularis.*—Torus mandibularis is similar to torus palatinus. The mandibular bony growth is usually bilaterally located lingually of the cuspid and first bicuspid and bordering on the reflected tissues. It is not a common anomaly. Ordinarily the tori must be located by palpation but sometimes they may be detected visually.

If tori are present, they are apt to be the most important immediate cause of denture instability. When the prosthesis is seated, a definite snapping sound can be heard as the denture border is driven past the tori. The tissues become severely traumatized and the denture becomes unbearable.

The denture should be generously relieved in the neighborhood of the tori but the length of the lingual flange is not lessened. The suggested treatment presents prompt relief to the patient and stability to the denture.

### Void Areas

Voids are areas of the impression surface of dentures which fail to make contact with the mucosa. Dentures possessing a large single void or smaller multiple voids are not stable because they lack adhesion by contact.

In the upper denture there may be a void below the extreme posterior region of the denture caused by an insufficient depth of post dam. In other instances there may be a large single central void caused by an excessively deep and arbitrarily placed central relief chamber or an injudiciously scraped impression.

Voids are sometimes created beneath the heels of the lower denture by reason of a deficiency of post dam over the retromolar pads.

Voids may be caused in both upper and lower dentures by slumping of unsupported impression correction material during impression taking, the presence of excessive pressure areas which permit the creation of voids in other localities of the impression or denture, indiscrimi-

nate cutting away of denture base material during attempts to locate areas causing trauma, inaccurate processing of the dentures and taking impressions when the soft tissues are still swollen after surgical procedures.

### Faulty Tooth Placement

The placement of teeth in incorrect relation to their ridges is a factor contributing to denture instability. Specific faults and their results follow:

1. Setting the posterior teeth too far buccally of the residual ridge induces a tipping leverage in a vertical direction.
2. Setting the upper and lower anterior teeth too far anteriorly promotes denture dislodgement by the lips.
3. Setting the lower posterior teeth too far lingually induces denture dislodgement by the tongue.

### Inaccurate Jaw Relation Records and Faulty Occlusion

Prosthetic literature is replete with methods for setting up teeth to obtain a suitable occlusion. Wax records and adjustable articulators contribute much to a desirable result.

Failure to establish centric relation of the jaws results in an absence of muscular balance. Excessive opening of the vertical dimension will stretch the muscles unduly, while an overclosure will collapse the muscles. Either condition contributes to denture instability. An excessive vertical dimension requires that the mouth be opened inordinately wide to accept food, and it also causes occlusal stresses to occur a great distance from the mucosa, thereby permitting undesirable leverages.

For purposes of denture stability, jaw relation wax records should assure (1) occluding rims which extend distally of the first molar, (2) an even reduction in the height of the occluding rims and (3) a low level of the lower occlusal plane, so that the tongue can help hold the denture down in its play across the occlusal surfaces of the lower posterior teeth.

For practical purposes, the initiation of denture stability, so far as balanced occlusion is concerned, begins with the delivery of the waxed-up dentures to the patient. At this time the posterior occlusion should be centralized anteroposteriorly, laterally and vertically, there should be a lack of contact of the anterior teeth after the correct amount of vertical and horizontal overbite has been determined and the posterior teeth should be set on a flat plane of occlusion.

I subscribe wholeheartedly to the brilliant concepts of DeVan,[1] who recommended (1) the use of compressive forces only in the posterior occlusal scheme, (2) the elimination of horizontal forces by employment of nonanatomic posterior teeth and omission of the compensating curve and (3) avoidance of the use of bilateral balance (three point contact) in the occlusal scheme.

On those occasions when patients insist on anatomic teeth, all cusps are judiciously reduced in height. For practical purposes, I employ narrow, low-cusped teeth and grind the cusps into flat facets.

Given a set of perfect impressions, together with a suitable tooth arrangement and an accurate technic in processing the dentures, judicious spot-grinding of the teeth with mounted stones seems to be all that is necessary to permit free gliding of the teeth in all ordinary mandibular excursions.

### Anatomic and Physiologic Shortcomings

Dentures may prove unsatisfactory because of adverse anatomic and physiologic conditions in the mouth. For example:

1. Tender areas under a denture may be caused by retained roots or bone infections.

1. DeVan, M. M., An Analysis of Stress Counteraction on the Part of Alveolar Bone With a View to Its Preservation. *D. Cosmos* 77:109 (Feb.) 1935.

2. The physiologic absence of adipose tissue in the submucosa is a factor contributing to denture instability.

3. Opposing undercuts in the jaw may cause the impression to be distorted on removal or may prevent accurate seating of the denture's marginal surfaces.

4. Movement of soft, pendulous tissues in the anterior part of both jaws will permit denture movement. This can be avoided by extending the dentures as far posteriorly as patient and tissue tolerance permit.

5. Distortion of the reflected tissues by inaccurately fitting denture borders results in the loss of muscle fiber elasticity and eventually in denture instability.

## Faulty Laboratory Procedures

Faulty boxing and casting of impressions may fail to reproduce details of the impression, including the important marginal areas. Careless polishing of dentures may result in the slicing off of important margins. Precise sculpturing of the denture's polished surface eliminates dislodging inclined planes and preserves stabilizing inclined planes.

## Comment

The questions that may occur to thoughtful readers of the foregoing explanations of instability of artificial dentures are these: Is there not something basically wrong with a system of denture construction that allows so much error? Is it not conceivable that a simplified plan of impression taking, such as the mucostatic system based on natural physical laws, is the solution to the denture problem? The answer to both questions is in the negative.

Patients seeking dentures are hopeful of many things, nearly all of which are attainable. They wish first for a tightly fitting upper denture, second for a reasonably retentive lower denture and third for an esthetic appearance of the six upper front teeth. Esthetics is not the province of this article, but factors in obtaining well-fitting upper and lower dentures will be discussed.

*Ideal Fit.*—Ideal full upper and lower artificial dentures have the following characteristics of fit:

1. The tissue surface of the dentures is closely adapted to the mucosa and to bony supporting areas.

2. The marginal surfaces of the denture flanges are adapted to the roof of the upper vestibule and to the floor of the mouth and the lower vestibule. The marginal surface is a definite denture entity.[2]

3. The occlusal surfaces of the teeth make suitable contact with each other, as herein described.

4. The polished surfaces of the denture, including the buccal, labial and lingual surfaces of the teeth, are fitted to the cheek muscles, the lip muscles and the tongue and its adjacent structures.

Locating the deficiencies that make a denture behave unsatisfactorily is not always an easy matter, but a close student of prosthetic dentistry should have no difficulty in correlating the material in this paper with his clinical observations.

*Mucostatic Technic.*—A few remarks on artificial dentures constructed from "mucostatic impressions" might be pertinent at this juncture. The most important question is this: If "mucostatic dentures" are constructed in accordance with natural laws, why do not these same laws hold true for the upper denture? It seems that the advocates of this system prefer to make only lower dentures according to their teachings. An upper denture constructed on the mucostatic principles would easily be dislodged by the cheek muscles.

2. Hirsekorn, H., *Denture Base Readjustment*. Baltimore: Williams and Wilkins, 1943, p. 31.

As for the lower denture, any appliance made by any fairly accurate technic, with any acceptable impression material and with or without digital or occlusal pressure, will remain stable on the ridge during mastication provided the buccal flange covers all or most of the bony buccal shelf. Inasmuch as patients prefer a good measure of retention along with stability, I use impression pastes and impression waxes with firm digital or occlusal pressure.

The greatest shortcoming of the mucostatic technic lies in the attempt to obtain a zero pressure impression of the mucosal ridge tissues only, with no attempt to utilize the more desirable intimate contact with the bony slopes and base of the residual ridge.

A mucostatic denture does not cover all the available area; it does not utilize the soft marginal surfaces of the vestibule; it does not fit the cheeks, lips and tongue, and it cannot readily support the cheeks and lips. If the occlusion is balanced, then only one of the four previously mentioned requirements for ideally fitting artificial dentures has been fulfilled. And if perchance the occlusion is not balanced, then there lies the denture, perched on top of the ridge waiting for a dislodging force to come along and move it off with accompanying destruction to the soft mucosa, the underlying bone and the patient's peace of mind!

***Basic Factors.***—The construction of stable artificial dentures depends, in the main, on (1) a proper diagnosis, (2) careful impression taking, (3) accurate jaw relation records, (4) judicious arrangement and occlusion of the teeth, (5) skillful sculpturing of the polished surface and (6) accurate processing and adjustment of the dentures.

Strict adherence to detail will result in automatic elimination of many of the disturbing factors in denture stability.—*10010 Euclid Avenue.*

***To Join or Not to Join.***—Despite the reports in the *British Dental Journal* there still seems to be a number of our members who are in doubt as to whether they should join the National Health Service or whether loyalty to the recommendations of the Council and to their fellow members makes it incumbent upon them not to join.

The position is, I understand, rather Gilbertian, for whilst we as a body officially frown upon and condemn the Scheme as being thoroughly bad, yet as individuals we are participating in it and in general making a remarkable success of it. I think therefore that it should be made quite clear that members are most definitely *not* expected to stay out of the Scheme if that would entail for them any mental or material suffering.—*W. Archer Hodgson, Brit. D. J. Supplement, Feb. 18, 1949, p. 24.*

# DIAGNOSIS OF PROBLEMS IN COMPLETE DENTURE PROSTHESIS

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DENTURES constitute the remedial and therapeutic vehicle of the dentist in treating the deranged function and partial loss of an important organ of the human body. This vehicle, to possess the maximum remedial, therapeutic and preventive values, must have its characteristics established by the dentist on concepts and principles accepted as valid and fundamental by the profession.

Unsatisfactory results in denture treatment are too readily attributed to poor workmanship and much less readily attributed to the adherence of dentists to incorrect concepts and principles. This statement can be justified best by discussing the concepts and principles basic to the performance of chair and laboratory operative phases and the technics and directives which they dictate. The laboratory phase largely determines the value of a prosthesis and more or less channels the prosthetic thinking of the dentist and the profession. It therefore seems appropriate to begin the diagnostic discussion with this phase.

## CONCEPTS AND PRESCRIPTIONS FOR LABORATORY OPERATIONS

### Mounting in Articulator

This laboratory operation is the first major one performed in accordance with a definite biomechanical concept of denture function and does, therefore, have a bearing on the end results. The procedure of execution is dictated by our concept and is transmitted to the technician by prescription or directives.

*Prescription.*—Mount the models and occlusion rims in the articulator by using the accompanying gnathostatic face bow record.

*Concept.*—Functional occlusion of anatomic denture teeth is dynamic and three dimensional in character. Therefore the models must be oriented three-dimensionally in the articulator if the prosthesis is to possess the maximum potential of correct function when inserted as an integral part of the human masticatory mechanism. Three anatomic points of reference are chosen to accomplish this —the axial center of the opening and closing movements, the Frankfort horizontal plane and the midsagittal plane. This requires the dentist to determine accurately the central axial point of the mandibular hinge axis, to parallel the occlusal plane to the Frankfort horizontal plane, to register correctly the midsagittal plane and to so set the face bow that the models will be oriented spatially and functionally to the articulator mechanism as the jaws are to the human masticatory mechanism.[1]

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1. McCollum, B. B., Fundamentals Involved in Prescribing Dental Remedies. *D. Items Interest* 61:522 (June) 1939.

***Common Practice.***—The occlusal plane is oriented in the mouth to the Frankfort horizontal plane, to the ala tragus line, to the mean mandibular ridge plane and by chance. It is oriented in the articulator to the common horizontal plane and to Bonwill's incisor point by a gig, by face bow settings, and by chance. The face bow is used occasionally, but generally no transfer apparatus is used to mount the models and bite rims in the articulator. Most dentists who employ the ordinary face bow are satisfied with an arbitrarily determined axial point and only a few dentists determine accurately the hinge axis center. Apparently the majority of dentists make no attempt to meet this concept. Whether such a concept and precise technic are required depends on whether vertical movement (third dimension) occurs in dynamic articulation of the teeth, whether articulation actually occurs in the eccentric ranges during masticatory or nonmasticatory acts, whether the vertical dimension is to be altered on the articulator and whether anatomic teeth are to be used. Since these items are either nonexistent or of minor importance, this concept seems unnecessary and the exactness and time required for execution unwarrantedly increases the cost of rendering a denture service.

## Articulator Specification

***Prescription.***—Use a fully adjustable articulator, make specified.

***Concept.***[2, 3]—The ideal service of today is predicated on the need for eliminating entirely any interference in the dynamic articulation of anatomic denture teeth. This objective can be attained only by orienting and fashioning occlusal surfaces in harmony with the functioning movement paths peculiar to each patient. This concept then dictates that the articulator must be adjustable to the extent of duplicating any and all variations in condylar path angulations and aberrating functional characteristics peculiar to each patient. Adjustable condylar controls are not the only articulator controls required to meet the dictates of this concept. Additional controls are needed for the Bennett movement, the rotary movement of lateral excursions, incisal gothic arch type movement and sagittal and lateral vertical incisal movement. Releasable centric locks, and incisal pin are required, and perhaps a milling device. Articulators of a few manufacturers are adjustable for all functional characteristics except the aberrating peculiarities. The adjustability of most other articulators is limited, and some lack all controls except an arbitrary hinge axis. No stock articulator is available today which will meet completely the specifications of this concept.

***Common Practice.***—The opinion has been expressed that today the so-called adjustable articulator is used to construct only one in a thousand dentures.[4] If the present day adjustable articulators are not used, what chance is there for a more complicated articulator to be used in denture construction? Some dentists use an articulator as an occluding frame and resort to the anatomic mechanism for the final arrangement.[5] Others make indirect use of the anatomic mechanism by employing the ruminating technic.[6]

The charge of unscientific and unprofessional denture service[7] is primarily re-

2. House, M. M., Art—A Fundamental in Denture Prosthesis. *J.A.D.A. & D. Cosmos* 24:406 (March) 1937.

3. Gysi, Alfred, Selecting a Form of Denture Service. *D. Digest* 35:73 (Feb.) 1929.

4. Rozsa, M. M., *The Technic of the Mouth*. Lab House, Jr.

5. The Central Nebraska Study Club, Complete Denture Service With Balanced Functional Occlusion. *J.A.D.A.* 30:366 (March 1) 1943.

6. Jaffe, S. S., A Simplified Full Denture Technique. *D. Digest* 52:382 (July) 1946.

7. Clapp, G. W., discussion of Campbell, D. D., Why Measurements of the Mandible, Tracings of the Condyles, the Construction of Hypothetical Triangles, and the Use of the Face-Bow, Are All Non-essential to the Construction of Full Dentures Possessing the Highest Degree of Efficiency. *J.A.D.A.* 5:223 (March) 1918.

lated to the failure of dentists to meet this concept, and apparently it is impossible to meet it with present day instruments and technics. A change from adherence to the costly, unpopular and unattainable concept of condylar guidance and bilateral balance to a concept related to the chewing cycle and unilateral balance would improve the service and eliminate the charge of unscientific and unprofessional denture service.

### Adjusting the Articulator

*Prescription.*—Adjust the articulator in accordance with the accompanying record.

*Concept.*—Adjusting the articulator precisely to accurate records of mandibular functional movements makes possible articulator movement paths identical to those of the mandible. This in turn makes possible correct articulation of denture teeth in the eccentric functional ranges. (It is understood that the direction of articulator movements is directly opposite that of the mandibular movements and that "realeff"—"resiliency and like effect"—renders them equivalent and not identical.)

*Common Practice.*—Maxillomandibular records used in this step can be classified into two general types, the functional and the static positional; into two degrees of functional range, the limited and the full range of mandibular movement, and into two and three dimensional character.

Practically all methods of securing this record are subject to errors. All records are subject to positional shifting of the recording bases on the mucosa, particularly the functional chew-in type. Static positional records are subject to the additional errors of distortion of the recording media and of the patient's failure to maintain a given maxillomandibular relation.

All records are subject to varying degrees of error in their interpretation or actual use by the dental laboratory technician. The more complicated the procedure the greater is the chance of error and incompetence.

It is questionable that any commercial dental laboratory technician, or even private technician, is capable of using correctly all the recording technics known to the profession, such as wax,[8] compound[9] and plaster positional records;[10] various chew-in types of records;[2] the optical recording mechanism,[11] and the mechanical recording mechanism.[12]

It must be kept in mind that various types of central bearing points and face bows are connected with this recording step and that many dentists use no record. Using no records would be strongly censured by devotees of the ideal concept under discussion. However, it can be justified amply by the alternative concept previously cited.

### Arranging the Teeth

*Prescription.*—Arrange the teeth according to the theory specified (spherical,[13] Avery,[14] MacMillan,[15] Pleasure,[16] ruminating,[6] Gillis,[17] Hardy[18] or Sobolik[19]).

8. McKevit, F. H., The Gothic Arch Tracing. *D. Digest* 35:145 (March) 1929.

9. Hospers, J. H., Plastic Registration of Mandibular Relation. *J.A.D.A.* 16:2217 (Dec.) 1929.

10. Stansbery, C. J., Functional Position Checkbite Technic. *J.A.D.A.* 16:421 (March) 1929.

11. Miller, J. S., An Optical System for the Registration of Mandibular Movements by Means of Light. *D. Digest* 44:8 (Jan.) 1938.

12. Terrell, W. H., A Simplified, Improved Full Denture Technic. *J.A.D.A.* 22:926 (June) 1935.

13. Keyworth, R. G., Monsom Technic for Full Denture Construction. *J.A.D.A.* 16:130 (Jan.) 1929.

14. Avery, B. W., and Avery, S. K., A Scissor-Bite Denture Technic; Using Incising Angles, Parallel Planes and Diverging Grooves. *J.A.D.A.* 17:1303 (July) 1930.

15. MacMillan, H. W., Clinical Application of Unilateral Balance to Prosthetic Dentistry. *J.A.D.A.* 18:1029 (June) 1931.

16. Pleasure, M. A., and Freedman, S. W., Practical Full Denture Occlusion. *J.A.D.A. & D. Cosmos* 25: 1606 (Oct.) 1938.

17. Gillis, R. R., Setting Up the Full Denture; Producing a Balanced Articulation. *J.A.D.A.* 17:228 (Feb.) 1930.

18. Hardy, I. R., Technique for the Use of Non-Anatomic Acrylic Posterior Teeth. *D. Digest* 48:562 (Dec.) 1942.

19. Sobolik, C. F., Observations on Occlusal Forms by an Edentulous Dentist. *D. Items Interest* 60:762 (Aug.) 1938.

*Concept.*—As it is impractical to discuss each of these theories here, a broad general statement must suffice. The theories can be roughly divided into two divisions. The first, best represented by the spherical theory, dictates that tooth contacts be multiple and in harmony with the anatomic guides and functional characteristics of each patient. With a variation in the angulation of the condylar and incisal guidance, the movement paths of intervening teeth must be arced and the paths must lie principally in the horizontal plane. The teeth, therefore, must be arranged with a compound curve (the Spee curve) running anteroposteriorly and a Monson curve running transversely.

The second division, best represented by the Pleasure theory, dictates that the tooth contacts should be on the working side only, and that their movement paths are dictated by the cyclic chewing stroke. Because movement on the working side is primarily on a hinge axis, the teeth are arranged in a straight line anteroposteriorly and with a transverse Avery curve merging into a Monson curve on the last molar. Sobolik eliminates all curves in their arrangement. With both concepts the teeth are placed favorably in relation to the ridge crest (buccolingually) to reduce adverse leverage. The concept of this division requires no articular guides except an arbitrary hinge axis.

The theories of both divisions are based on biomechanical factors. The former emphasizes the biologic factors principally related to the temporomandibular joint and the latter emphasizes the mechanical factors related to the masticatory act. The former requires precise, time consuming technics and costly instruments, whereas the latter requires neither.

*Common Practice.*—It is difficult to state authoritatively what arrangement of denture teeth is now common practice. Arrangement for the spherical concept has been standard practice for perhaps half a century. Incomplete and inaccurate articulator settings (later discussed) have been and are still being used with the spherical concept. It must follow that the arrangement of denture teeth does not absolutely conform to the dictates of the spherical concept.

## CONCEPTS AND TECHNICS OF CHAIR OPERATIONS

The cause of trouble and failure in denture treatment is not confined to the laboratory phase. In chair operations undesirable end results are not entirely due to the inferior skill of the operator, but may also result from adherence to incorrect concepts and technics of execution. These can best be comprehended by critically analyzing important chair operations.

### Impressions

The retention and stability of dentures has for years been considered directly proportional to the excellence of the impression, and many dentists still consider impression making the most important step in a denture technic. A good impression is essential but by no means can it be considered to neutralize detrimental occlusal forces.

*Concept.*—Food comminution is a physiologic process which entails the application of physical stresses operating through laws of physics and mechanics and tissue reactions occurring according to biologic principles. Force applied intermittently for short periods is tolerated by the tissues without biologic change. Force continuously applied will cause biologic change. Heavy force is destructive whereas light force is stimulating.

The ability of tissues to receive force

without biologic change depends somewhat on their type and volume and on blood and nerve supply. These factors are variable in the tissues of the denture area. The tissues of the ridge crest area react more favorably to force of varying magnitude, direction of application and intervals of duration than do the tissues of the vestibular ridge area which react more favorably to light continuous force such as is associated with positive denture seals. In the impression step the anticipated forces and tissue reactions are correlated, compensated, and recorded in a manner suitable for transmission to the denture base.

The concept dictates that for favorable distribution of forces, a maximum amount of the oral supporting surface should be incorporated; for greater denture stability, as much tissue resiliency should be eliminated as is compatible with tissue health; for correct application of denture seals, periphery of the impression should be established as far from the ridge crest as is compatible with border tissue function;[20] for positive, effective and harmless seal, the tissue, lip and cheek valve types should be combined; for best peripheral values no molding should be executed except at taut frenums; for surface apposition, the adaptation should be real, yet of the smooth, even surface type.[21]

Continuous denture use causes a slow but constant detrimental alteration of the biomechanical qualities of the tissues of the denture bearing area.[22] As the soft tissues become hyperplastic, it is imperative that the increased resiliency be reduced by tissue placement or excision.

**Common Practice.**—Dentists freely adopt newly presented impression theories or technics without thorough analysis of their contribution to the attainment of over-all objectives of denture service. There are several concepts of impression taking which are favorably considered by the profession, but which conflict in varying degrees with the basic concept and objectives of this operation. The following theories are basic to current practice:

*The mucostatic theory.*[23] This theory dictates that the tissues be copied at their static rest condition with short flanges and no valve seals. This may be satisfactory for normal mouths where non-anatomic teeth and the Sobolik or Boswell arrangement are to be used, but it is unsatisfactory for less advantageous functioning conditions. Increased retention is the main advantage claimed by followers of this theory. Retention and stability of a prosthesis involve more than adaptation of the base to the tissue surface.

*Controlled displacement theory.*[24] This theory dictates that denture stresses be anticipated and that a planned displacement of tissues be effected to counteract the detrimental effect of such stresses on denture function and health of the tissues. This theory has had the support of the profession for more than half a century.

*Physiologic loading of tissues,*[25] *opposed to manual loading.*[26] The theory of physiologic loading of tissues dictates that the loading of the supporting tissues be accomplished by the patient's biting pressure, which is supposed to apply the force in a direction normal for the patient and distribute it evenly over the entire area. The theory of manual

20. Bodecker, C. F., Histology to Prosthodontia. *J. D. Educ.* 4:276 (Apr.) 1940.

21. Slack, F. A., Jr., *The Physiological Impression Versus the Mechanical.* Research Bulletin, Prosthetic Department, University of Pennsylvania, 1945.

22. Wright, W. H., The Importance of Tissue Changes Under Artificial Dentures. *J.A.D.A.* 16:1027 (June) 1929.

23. Addison, P. I., Mucostatic Impressions. *J.A.D.A.* 31:941 (July 1) 1944.

24. Tench, R. W., Afterthoughts Concerning Impressions for Full Dentures. *J.A.D.A.* 15:37 (Jan.) 1928.

25. Drexler, J. H., Method of Taking Modeling Compound Impressions With the Mouth Closed and Under Normal Biting Strain. *D. Cosmos* 60:225 (March) 1918.

26. Pendleton, E. C., The Positive Pressure Technique of Impression Taking. *D. Cosmos* 73:1045 (Nov.) 1931.

loading dictates that the operator manually apply the pressure, either centrally or bilaterally, in a direction that tends to seat the tray evenly over the supporting area. Both are subject to wide variations in amount and direction of applied pressure.

*Functionally molded peripheries,*[27] *opposed to manually molded.*[28] Dentists hold varied opinions on the importance and the means of establishing the width, contour and thickness of the peripheral extension of an edentulous impression. Generally the patient activates the border tissues by prescribed functional movements of the lips, cheek, tongue and mandible, or the operator activates them manually. In neither instance can the degree of activation best suited to the patient's individual requirements be judged accurately. The problem is further complicated by the wide range in working qualities and the resistance that impression materials offer to tissue tension. It seems, therefore, that there is some justification for accepting an arbitrary empiric method of denture peripheral determination.

*Smooth impression surface,*[21] *opposed to rough detailed surface.* Only recently has the theory been projected that a smooth impression surface is less likely than a detailed surface to cause irritation. The physical characteristics of denture function seem to contraindicate detail of the impression surface, and it is doubtful if such detail as is currently obtained is carried over to the prosthesis.

Further discussion of other items of current impression practice would only emphasize the diversity of practice, and the misconceptions which cause trouble and failure. It would seem that solving the articulation problem would simplify the impression operation.

## Establishing Vertical Dimension

This step is actually a division of the operation of establishing maxillomandibular relations. Vertical dimension is the relation of the two jaws in the vertical plane. It has been pointed out frequently in the last decade that error in concept and execution of this operation has been responsible for discomfort and malfunction in areas adjacent to the denture field.[29] This error has produced obscure types of complaints which previously have been referred to the ear, nose and throat specialist.

*Concept.*—The concept of this operation is predicated on the assumption that the physiologic rest relation of the mandible to the maxilla is constant throughout life.[30] The physical rest position (centric occlusion) is a more closed relation, averaging about 4 mm. less, and this is the relation required in this operation. There has been presented the theory that a change in the relations of the muscles of a specified group alters the group action, which in turn affects adjacent groups and continues as a chain reaction;[31] for example, change in the muscles of mastication causes change in the muscles of the face, throat, chest and back, and a forward carriage of the head and neck causes drooped shoulders, sagging chest and incorrect posture. It must follow that deranged function results from malrelated structures. The determination of vertical dimension should be considered more important and of a more comprehensive nature than it is at present.

*Common Practice.*—Wide variation exists in the execution of this step. Some den-

27. Schlosser, R. O., The Tested Functional Impression as a Positive Means for Determining Maximum Surface Extension and Correct Peripheral Outline Form for Full Denture Bases. *J.A.D.A.* 21:1053 (June) 1934.

28. Neil, Ewell, *The Upper and the Lower.* Chicago: Cal Technical Library, 1941.

29. Goodfriend, D. J., The Role of Dental Factors in the Cause and Treatment of Ear Symptoms and Disease. *D. Cosmos* 78:1292 (Dec.) 1936.

30. Thompson, J. R., The Rest Position of the Mandible and Its Significance to Dental Science. *J.A.D.A.* 33:151 (Feb. 1) 1946.

31. Harris, H. L., Effect of Loss of Vertical Dimension on Anatomic Structures of the Head and Neck. *J.A.D.A. & D. Cosmos* 25:175 (Feb.) 1938.

tists use an anthropologic norm for all patients.[29] Some use related functional acts and deduce the correct dimension.[32] Some use the patient's subjective sense to determine the dimension,[33] and some acquiesce to the patient's demands for youthful appearance. Some use an apparatus to measure and determine the vertical dimension at which maximum muscle power is delivered.[34] Some compensate for leverage control. This operation needs simplifying, both in concept and instrumentation, but perhaps it will continue to be a cause of trouble, chiefly because of esthetic and leverage demands.

## Establishing Centric Relation

A prominent cause of discomfort and malfunction, particularly with anatomic teeth, is the failure to obtain correct centric relation. This has been estimated as a fault of about 90 per cent of full dentures.[35]

*Concepts.*—The concept dictates that there is a correct anatomic starting point, or condyle fossa relation, for each movement of the mandible, and that this point must be established for correct articulation of the denture teeth.

*Common Practice.*—The needle point tracer is considered the only scientific means of accurately determining centric relation.[36] The most logical way to get accurate results is to develop the envelope of movements. Arrow head tracings require great skill and control by the patient for accurate results. Central bearing points correctly placed facilitate the securing of needle point records.[37] Probably most dentists accept a bite relation which the patient believes is correct, for they apparently make no use of these instruments. Such a relation is usually incorrect, because patients have lost control of their jaw movements and their acts are studied rather than natural.[31] When the dentures are completed and in use, they evidence the incorrectness of the accepted relation. A great deal of experience in detecting centric relation and skill in controlling the patient are necessary when using the simple bite method. The use of nonanatomic teeth reduces the need for absolute accuracy in establishing centric[38] relation.

## Registering the Condylar Path

The execution and need of registering the condylar path has been discussed by dentists for more than half a century.[39] The record produced in this step makes possible the reduction of functioning conditions to a physical and mechanical basis that can be recreated in an articulator.

*Concept.*—The concept dictates that the articulatory characteristics of the two condyles in conjunction with a third arbitrary tooth guidance are the guides and controls of the articulating characteristics of denture teeth and that the dentures must have a minimum of three separate and distant points of tooth contacts at any static point or gliding path within the functional range of the teeth.

*Common Practice.*—The several technics used to accomplish this step have been briefly discussed under the heading of articulator setting. A positional protrusive wax record is generally used for

32. Gillis, R. R., A Denture Technic Applicable by the Average Dentist. *J.A.D.A.* 20:305 (Feb.) 1933.

33. Niswonger, M. E., Obtaining the Vertical Relation in Edentulous Cases That Existed Prior to Extraction. *J.A.D.A. & D. Cosmos* 25:1842 (Nov.) 1938.

34. Boos, R. H., Intermaxillary Relation Established by Biting Power. *J.A.D.A.* 27:1192 (Aug.) 1940.

35. Harper, R. N., Analysis of the General Practitioner's Complete Denture Service. *J.A.D.A.* 26:244 (Feb.) 1939.

36. Gysi, Alfred, Practical Application of Research Results in Denture Construction. *J.A.D.A.* 16:199 (Feb.) 1929.

37. Boucher, C. O., Errors Developed by the Use of Central Bearing Point in Adjustment of Articulators, *J. D. Res.* 17:91 (April) 1938.

38. Kurth, L. E., Anatomic and Non-Anatomic Teeth. *J.A.D.A.* 31:35 (Jan. 1) 1944.

39. Walker, W. E., Prosthetic Dentistry; the Glenoid Fossa; the Movements of the Mandible; the Cusps of the Teeth. *D. Cosmos* 38:34 (Jan.) 1896.

setting the articulator.[40] The protrusive path is 10 or more degrees less steep than the lateral path[41] and is used less frequently for masticatory purposes—a ratio of 1 to 15.[42] Functional methods of securing the record do register in a usable manner all desirable information except the peculiar aberrating character of an excursion.[1] Boucher's technic seems capable of recording this peculiarity along with all the other information but apparently is not popular.[43] This step is generally executed too inaccurately and too incompletely to satisfy the dictates of the concept, and the inappropriateness of the concept will be discussed later.

### Insertion and Adjustment of Denture

The final appointment of the patient and the dentist is a most important one to both. On insertion the dentures become a real part of the patient, particularly from the psychologic point of view. The patient's first impression of the appearance and the general feeling of comfort, of intimacy of contact, of utility and of the dentist's skill are important reactions. All adjustments possible should be made immediately, before the patient has a chance to see the result. Using the dentures for two or three days before this is done initiates tissue changes that are destructive and uncontrollable. The retention of modern lower dentures is so improved that there is little or no psychologic advantage in delaying insertion until a subsequent visit. Better tissue and functional adaptation are obtained if both dentures are adjusted and inserted at the same time.

To equilibrate the occlusion, some dentists prefer selective spot grinding[44] and others machine paste milling.[45] The choice of technic is determined partly by the theory of articulation favored by the dentist and partly by the type of posterior teeth used. Theoretically and practically anatomic teeth are better equilibrated by machine paste milling on an adjustable articulator. However, such equilibration of anatomic occlusal form requires guides in addition to the condylar path. Spot grinding gives excellent results with nonanatomic teeth, for a minimum of guides and adjustments are required. Patients should be seen for the successive three or four days after insertion of the dentures to make needed adjustments and to correct misconceptions about their use. A paper could be written on the topic of instructions and information given to denture patients, but the subject must be dismissed here with the statement that incomplete, inaccurate and inappropriate instructions and information are generally given.

40. Swenson, M. G., *Complete Dentures*. St. Louis: The C. V. Mosby Company, 1940.

41. Gysi, Alfred, An Analysis of the Development of the Articulator. *J.A.D.A.* 17:1401 (Aug.) 1930.

42. Cohen, L. A., personal communication.

43. Boucher, C. O., Method of Recording Functional Movements of Full Denture Bases in Three Dimensions. *J. D. Res.* 14:39 (Feb.) 1934.

44. Schuyler, C. H., Fundamental Principles in the Correction of Occlusal Disharmony, Natural and Artificial. *J.A.D.A.* 22:1193 (July) 1935.

45. House, M. M., The Correction of Mal-occlusion in Artificial Dentures. *J.A.D.A.* 7:339 (April) 1920.

## PROFESSIONAL PROBLEMS

Within the last five years a renowned prosthodontist has stated that students are not taught the fundamentals of this field in dental colleges, that they blindly follow a routine, that a great deal of empiricism enters into a complete denture service and that the faculty most needed for success is a sixth sense.[46] Another dentist wrote that he had fol-

46. Essig, N. S., Reaction to Some of Our Contemporary Writings. *D. Items Interest* 65:70 (Jan.) 1943.

lowed one after another of various technics, methods and principles advocated by competent authorities and interested organizations and finally reverted to the teachings of his college professors with the realization that objectives and a suitable treatment plan must be visualized before rather than after constructive steps are taken.[47] No sixth sense is necessary for success in the denture field, but rather a keener perception of the problems involved, a greater application of the specific and general knowledge associated with a complete denture service, a greater perfection in the skills required, a more patient and sympathetic response to the desires and complaints of denture patients, and last but not the least, a firmer embrace of the golden rule.

A recent survey indicates that less than 50 per cent of the dentures in use have been successful from the day of insertion when judged from the point of view of complete comfort and utility. It also indicates that with continuous wearing, about 25 per cent of the dentures achieved this success by tissue and functional adjustments, and that about 10 per cent were total failures, with the remaining dentures still in the indeterminate stage.[48] Such reports accurately evaluate the effectiveness of our denture service, and it must be concluded that prosthodontists do have problems that need solving. It is apparent to any dentist who gives a little thought to the profession's denture service that the correctness of present day theories and technics taught in dental colleges and in general use by the profession are and should be questioned.

It should be expected that practicing dentists would develop ideas and methods for rendering better service, and would desire to project them as helpful suggestions or as a panacea for troubles. The projection of many ideas and technics and their accumulation fouls the thinking and the perception of most dentists and thereby decreases the value of the treatment rendered. Fundamentals and a step by step routine are taught to all students aspiring to a dental degree. Youth in dentistry is much the same as youth in general—the advice of elders with experience is never as valid as the knowledge gained by personal experience. This process of gaining personal experience often blots out or obscures the well-marked pathway projected by the college. Therefore a new pathway must be discovered by each, or considerable backtracking be done at great sacrifice and discomfort to the operator and the patient.

Abraham Lincoln said, "If we could first know where we are and whither we are tending, we could better judge what to do and how to do it." In prosthetic dentistry we have had eras and cycles of exploring and denoting anatomic structures and psychologic functions involved in denture treatments. We have analyzed and investigated about every angle of our problem, but it is questionable if the point of view and deductions have been correct.

Where are we now? We have advanced to the threshold of a new era of health service. We must evaluate the knowledge and experience we have gained and correlate our knowledge with the objectives of the service.

Where are we going? Along the pathway of developing a simple, uniform plan of denture construction based on simple theories that are actually related to the objectives of this service.

How are we going to get there? Certainly not by repeated cycles of rehashing ideas and technics which catch the attention of the rank and file by clever salesmanship, persuasive oratory or the prominence of the authors. We cannot

47. Goodman, J. B., Full Denture Construction. *D. Items Interest* 65:542 (June) 1943.

48. Clark, Survey of Denture Wearers in the U. S. Binghamton, N. Y.: Cleveland, Inc., 1947.

depend on dentists engaged in private practice, organized denture societies, commercial dental organizations or dispersed and poorly directed groups of investigators to carry on the necessary research, to correlate and evaluate the findings, to enunciate the theories, principles and necessary technics of execution. None of these agencies can offer the indispensable reliability and centralized direction and control that are needed. The best possible centers for this correlation of knowledge are the dental colleges of the country. They could easily become a unified, centrally directed, reliable and professionally acceptable organization to investigate and solve the problems of denture treatments. There is no better source of trained operators with the needed theoretic and practical knowledge and experience, of related scientists available for consultation, of clinical material, laboratory facilities and personnel. There is no group on whom the moral and actual responsibility for dentistry's advancement rests more heavily.

## RECOMMENDED PARTIAL SOLUTIONS

The first line of attack is to determine our major objectives. Their determination will indicate the possible solution of many problems.

### Major Objectives

*Masticatory Function.*—Is our first major objective the restoration of masticatory function? Campbell[49] stated, some years ago, that in this age of food choppers and colanders, teeth are not essential for the preparation of food for digestion. Estimates have been made that the teeth are used for food comminution not more than one and a quarter hours a day. This is about 5 per cent of the time the dentures can be in the mouth. Many of the oldest living persons have been without either natural or artificial teeth for many years. This function does not seem to be a sufficiently dominating one to dictate all the characteristics of the denture.

*Esthetics.*—Is the restoration of oral and facial appearance our first major objective? The patient may have little or no social, civic or business need for normal, natural or pleasing facial characteristics. He may even be totally lacking in visual appreciation—he may be blind. This quality does not seem sufficiently dominant to dictate all the characteristics of the denture.

*Prevention.*—Is the prevention of further damage to the organ and structure, or of further impairment of function, our first major objective? Patients have little comprehension of what constitutes damaging or impairing forces or conditions. Professionally it is known that if the maximum value of this factor were imparted to the dentures, in many instances they would be useless. It also cannot dictate the characteristics of the denture.

*Deductions.*—There is a primary need and a single quality which meets it, and when this quality is lacking the denture is a failure. This quality is comfort—physical and mental comfort. The physical and mental discomfort of the edentulous person is really the compelling force that drives him to the dentist. Discomfort in the use of artificial dentures is the primary cause of failure. Schuyler[50] and Wright[22] have each reported an instance

49. Campbell, D. D., discussion of Wright, W. H., Anatomic Influences on the Establishment of Balanced Jaw Relations and Balanced Occlusions. *J. A. D. A.* 15:1102 (June) 1928.

50. Schuyler, C. H., Problems Associated With Opening the Bite Which Would Contraindicate It as a Common Procedure. *J.A.D.A.* 26:734 (May) 1939.

of a patient who expressed a preference for death rather than continued life with uncomfortable dentures.

Our first major objective, then, is the attainment of physical and mental comfort. All other objectives must contribute to its attainment and maintenance.

Our second major objective is a composite of the restoration of masticatory function and the creation of a pleasing dental and facial appearance.

Our third major objective is the prevention, to as great a degree as is compatible with the other objectives, of further damage to and impairment of the function of the composite mechanism.

## Analysis of Objective Factors

*Physical Discomfort and Trauma.*—Physical discomfort is caused mostly by trauma, a product of forces transmitted through the denture base to supporting tisues. Trauma results from denture instability, from improper preparation of the oral support for dentures and from lack of understanding by the patient of the use or rehabilitating potential of dentures.

*Nonmasticating Tooth Contacts.*—Trauma is generated almost exclusively at the occlusal plane of the dentures by tooth contacts and by the power applied on the food bolus. It has been estimated that the upper and lower teeth come in contact with each other approximately 10,000 times a week.[51] Sobolik[19] is the only investigator who has paid any attention to nonmasticating contacts. The importance of his report is that the stress involved is slight and of near-vertical direction of application, and that the contacts occur chiefly in what he terms the centric ranges. These contacts are essentially eccentric, but the eccentricity is so slight that it is of little importance. Nonmasticating contacts, therefore, should not be considered as possessing such a potential of trauma as to require an involved concept of tooth arrangement and denture function to control them.

*Comminuting Act.*—The chief source of trauma and discomfort is in the function of comminuting food. Sobolik states that the initial few strokes are vertical, crushing strokes to express the fluid and semifluid content of the bolus, and that little power is needed to accomplish this function. The food bolus then becomes resistant and the stroke changes to a gliding, shearing and milling action essentially in the horizontal plane and from without inward. In this heavy duty stroke the power applied gradually increases to its maximum at the centric range.

Tooth-to-tooth contacts occur only when the teeth penetrate the bolus. The important point relative to these contacts, as deduced by Sobolik, is that they occur in the centric ranges, a little before and a little after dead centric occlusion. Both Gysi and Hildebrand[52] report that the masticatory stroke is cyclic in character and approaches the bolus from an inferior, without-inward direction, that it is compressive and shearing in nature, and that the centric glide does not exceed 2 mm. in length. Tench[53] reported a case in which the cycle was reversed and identical to the ordinary articulator excursive movements. Usability and comfort were attained only after the patient's masticatory movements conformed to the Gysi-Hildebrand concept. Such function and tooth contacts do not parallel the concept of spherical occlusion exemplified by attention to condylar guidance and bilateral balance.

*Role of Bolus.*—The pressure required for breaking up different foods varies from

51. Kimball, H. D., Determinations Regarding the Strength of Denture Materials: Vulcanite. *J.A.D.A.* 23:579 (April) 1936.

52. Hildebrand, V., Studies in Mandibular Kinematics. *D. Cosmos* 78:449 (May) 1936.

53. Klaffenbach, A. O., Gnathodynamics. *J.A.D.A.* 23:371 (March) 1936.

250 pounds for bread crust to almost none for mashed potatoes. The bulk and adhesive character of foods have differing influences on the movements required of the lips, cheeks, tongue and mandible to control and keep the bolus between the teeth. Soft and brittle foods as a rule are not difficult for the denture patient to masticate or control, but fibrous, tough and adhesive foods are troublesome. Closure of denture teeth on the compressed and resistant bolus causes direct and resultant forces which tend to tip and skid the dentures on the mucosa. This creates overloading of localized ridge areas and results in detrimental changes in the biologic supporting tissues and diminished and restricted use of the dentures. Because of their inclined planes, anatomic teeth are potentially more offensive in this respect than are the near-horizontal surfaces of nonanatomic teeth. Concepts and technics most effective in the control of this type of trauma are not those now considered fundamental to denture occlusion, but are some part or combination of the concept advanced by MacMillan, Avery, Pleasure, Sobolik and Boswell.

*Masticatory Force.*—Is the force required for chewing food responsible for some of the trauma and discomfort? It has been reported that the biting force exerted on the restoration decreases as the number of the teeth replaced increases and is therefore reduced to the minimum with complete artificial dentures.[53] This reduction of force is caused by pain or discomfort, which in some instances is so great that resistant foods must be eliminated from the diet. Head[54] reported many years ago that in the mastication of food the shearing action of the lateral stroke was responsible for reducing the force requirement to about a sixth of that required for a purely vertical stroke. A posterior tooth form which encourages greater use of lateral strokes is a means of reducing trauma and increasing comfort because of the reduced need for masticatory force.

*Occlusal Forms.*—Are anatomic or nonanatomic teeth better grinders of foods, and is this factor a source of denture troubles? Investigators of this phase have not reported any significant difference in their efficiency.[55] Hardly any patients complain of a lack of "chewability" of nonanatomic teeth. The most that can result from their use is a slight increase in the number of strokes required to break up the food. This is no serious penalty, for human beings are prone to bolt their food. Recall the failure of Fletcherism. However, Sobolik and other denture-wearing dentists have reported definitely greater discomfort with anatomic occlusal forms.

*Balance.*—Is protrusive and lateral balance essential to reduce trauma and other denture troubles? Analysis of the contacting area of the teeth, of the characteristics of the chewing stroke, and of the role of the food bolus indicates that balance is a superfluous complication. Especially does this seem true when balance is predicated on the accurate registration and use of the patient's individual condylar path.

Gysi[41] has stated that a variation of 10 degrees in the angle of the condylar path has little influence on the articulation of the teeth, and then only in the region of the second molar. It has been demonstrated that most of the chewing of food is done in the second bicuspid and first molar regions of the working side.[56] The path record employed for

54. Head, Joseph, The Human Skull Used as a Gnathodynamometer to Determine the Value of Trituration in the Mastication of Food. *D. Cosmos* 48:1189 (Dec.) 1906.

55. Thompson, M. J., Masticatory Efficiency as Related to Cusp Forms in Denture Prosthesis. *J.A.D.A. & D. Cosmos* 24:207 (Feb.) 1937.

56. Ono, Iwao, The Crushing Power and Masticating Area of the Teeth as the Foundations of Oral Hygienics. *D. Cosmos* 63:1278 (Dec.) 1921.

setting the articulator and balancing the dentures is generally the one least used in comminution of food and the one with the least steepness of angulation—the protrusive path.

The following facts must be admitted:

1. The lateral rather than the protrusive range is used for comminution of food.

2. The bolus eliminates tooth-to-tooth contacts except in the centric range.

3. The teeth influenced by varying condylar path inclinations are not in the functioning area nor on the working side of the jaw.

4. The allowable error in angulation of the condylar path tends to minimize much of the importance attached to its variation from average.

5. An inaccurate record is used.

6. Less than one in a thousand dentures have had the supposed benefits of bilateral balance and individualized service of the condylar guidance built into them.

7. Fifty to 75 per cent of the dentures are successful.

It would seem, therefore, that much of the trouble encountered has been caused by the attempt to incorporate the present concept of balance, rather than by failure to attain it. The MacMillan and Sobolik theories are directly opposed to present concepts, and it is claimed that their methods reduce trauma almost to the vanishing point and that the procedures are simplified. Slack[57] reports a total of only 37 adjustments in more than two years with 64 dentures in which this tooth arrangement was used. Such a report lends weight to the claims advanced and certainly is a challenge to the so-called scientific methods now in vogue.

*Tooth Materials.*—It would seem that the use of plastic teeth would greatly reduce trauma and discomfort. Patients who have worn dentures with plastic and porcelain teeth state that the plastic teeth are more comfortable, that the occluding pressure feels softer to them, and that they are considerably less noisy.[58] Increasing numbers of patients are requesting plastic teeth as their advantages are becoming common knowledge. Dentists have hesitated to supply them because of their inferior physical properties. These properties have been improved to the extent that it is reasonable to expect them to retain serviceable relations for as long as it is believed safe to wear an unaltered denture. Five years is considered the useful life of a denture because of tissue changes.

*Denture Skidding.*—Denture skidding is the horizontal movement of the denture on the tissue surface, which often is accelerated by a vertical disengagement. Various researchers have reported that considerable horizontal force operates on dentures as a result of the masticatory act and that this does produce horizontal and rotary movement of the denture on the tissues. Denture skidding is not simply the movement of smooth hard surfaces over each other, but rather the movement of an irregular hard surface over a correspondingly irregular resilient surface. DeVan[59] has characterized the resulting stress on tissues as tensile and shear. The stretching and rubbing of tissue fibers over one another produces tissue hyperplasia. Wright[22] reported that in 100 test cases, two-thirds showed clinically a thickened layer of soft tissue after one year of denture use. Pendleton[60] demonstrated that a continuous plus or minus pressure causes both soft tissue hyperplasia and bone changes. It has

57. Slack, Fred, personal communications.

58. Patterson, R. M., Plastic Teeth in Prosthetics. *D. Items Interest* 65:273 (March) 1943.

59. DeVan, M. M., An Analysis of Stress Counteraction on the Part of Alveolar Bone With a View to Its Preservation. *D. Cosmos* 77:109 (Feb.) 1935.

60. Pendleton, E. C., Minute Structures of an Upper Jaw That Supported a Complete Denture Opposed by Five Natural Mandibular Teeth. *J.A.D.A. & D. Cosmos* 24:705 (May) 1937.

been suggested that resorption of alveolar bone under dentures is an inflammatory reaction to trauma and not a physiologic resorption simply because the teeth have been lost.[61] Instability of dentures is therefore the cause of many functional deficiencies of dentures as well as structural changes in the supporting foundation.

Some factors contributing to denture skidding are (1) posterior teeth arranged externally to the ridge crest, (2) the compensating curve, (3) improper level of the occlusal plane, (4) improper inclination of the occlusal plane, (5) incorrect centric relation and occlusion, (6) gnashing of cusp planes, (7) tripping action of cusps, (8) lack of centric balance and (9) tongue crowding. Denture skidding may not be eliminated entirely, but it surely can be considerably reduced by changing our concepts and technics to those with a more practical bearing on the articulation of teeth and control of stress.

***Mental Discomfort.***—Mental discomfort is caused by poor esthetics, atypical and embarrassing habits of chewing and incising, food selection and preparation which focus the attention on the debilitated condition, gross loss in the use potential of dentures, temporary or permanent derangement of speech habits and noisy speech or eating.

***Esthetics.***—In order to realize the mental discomfort caused by unesthetic dentures one need only realize the varied means in present day living of stimulating appreciation of and a demand for beauty in one form or another, particularly in America with its advanced standards of living. It must follow that denture patients will demand restorations producing esthetic, harmonious, and to some extent youthful, dentofacial characteristics.

Age has a dental beauty which requires extra effort of the operator if his artistry is to be in tune with nature and the reactions of the patient. Advancing age mellows the color and other characteristics of dental and facial features. Older age groups therefore require teeth modified by stains, erosion grooves, check lines, irregular surface facets, and so forth. However, some patients are dissatisfied with denture characteristics common to their real age and request "nice, small, white teeth." Such cases require tact and skill.

***Arrangement of Teeth.***—Patients are inclined to notice critically the shape, size, color and prominence of teeth, and these items are of first importance to them. Of secondary importance is the alignment, composition of irregularities and composition of aging effect. Irregularity in the alignment of teeth is usually present in all but the square type, and occasionally with it also. It is reasonable to assume that considerable modification of tooth characteristics will have occurred during the predenture years. The failure to use aging effects and irregularity in the arrangement of denture teeth will cause esthetic difficulties. Overdoing the modification of the teeth is as bad as not doing any at all. A good many operators overdo the irregularity of arrangement because of past criticism of denture esthetics ("store teeth," "picket fence arrangement"). Facial asymmetry is generally present to some degree, and calls for a modification of tooth arrangement, size, form or type to create facial balance and good appearance. One should not make the mistake of considering that denture esthetics can be confined to the upper anterior teeth. The lower anterior teeth have a minor role in the display of tooth characteristics, but they do play an important part in supporting the lower lip and in developing the profile. Overjet, particularly when there is retrusion of

61. Pendleton, E. C., Biologic Factors in Full Denture Service. *J. 2nd. Dist. D. Soc. (N. Y.)* 27:99 (Dec.) 1941.

the mandible, must be observed from the esthetic point of view as well as from the mechanical.

*Selecting Teeth.*—The step of selecting teeth is important yet clouded with conflicting concepts and technic. The typal theory of tooth selection is questioned by some. However, the important point is that this method emphasizes the possibility of obtaining harmony by similarity of tooth outline form to face outline form. Denture artistry must be attained either by similarity or by contrast of the teeth to their background—the features of the face. Harmony by contrast is a more difficult accomplishment. Denture teeth have more natural labial and outline form, surface markings, color and translucency today than ever before. It is possible, even, to obtain teeth with the characteristics of age. Low fusing stains and porcelain are available so that dentists can apply their own artistic skills in characterizing the teeth. Today, there seems to be no excuse for unesthetic dentures.

## Practical Difficulties

*Diagnostic Survey.*—The prominent prosthodontists of today, as well as those of preceding generations for almost the past hundred years, have specified the diagnostic survey as the cardinal beginning step. This one empiric practice has become a fundamental principle in complete denture prosthesis. To delete it, or to perform it half-heartedly, is to invite trouble.

*General Items.*—Age, sex, general health, nationality, occupation and hobbies, previous denture experience and type of denture worn should all be ascertained. These items make possible an evaluation of the environmental problems peculiar to each patient, giving an indication of the patient's adaptability, his freedom and activation, his reserve and recuperative powers, and the magnitude of the difficulties carried over from preceding denture usage.

*Biologic Items.*—The dentist should note the characteristics of the osseous tissues; the character, distribution and volume of soft tissue of the supporting area; height and tenseness of border tissue, sensitivity of palate; form and activity of the tongue; function of the temporomandibular joint; muscle tone, and finally, though not least in importance, the mental attitude. These items indicate the need for surgical intervention, treatment by a physician or other specialized treatments. A diagnostic survey acquaints the operator with the conditions, structures, functions and reactions of the patient that are indicative of difficulty. It enables him to form a plan of treatment which best compromises all difficulties, and to a large measure permits him to prognosticate the end results and costs.

*Surgical Intervention.*—One common cause of difficulties in this field is the reluctance of dentists to perform surgical operations to correct unfavorable oral conditions which the survey reveals. Exodontists and oral surgeons are more likely to see such conditions first, and should correct them before dismissing the patient. Patients greatly dislike undergoing further surgical treatment after reaching the prosthodontist. The surgeon should be emphatic that the preparation of the denture supporting area be completed before the patient is discharged and he should consult with the prosthodontist when necessary.

*Hormones and Vitamins.*—It is very probable that today insufficient use is made of hormonal and vitamin treatments and the correction of nutrition. Reports indicate that such treatments can solve some of the obscure complaints of denture patients, such as hot, burning and tingling tongue or mucosa, cheilosis, and perhaps resorption.

## CONCLUSIONS

To realize that currently accepted concepts of denture function and resultant technics of construction are being questioned, one need only check the numerous articles appearing in the literature of the last decade which digress from or completely exclude the theories of condylar guidance and bilateral balance. The authors are not only the courageous young research workers but also the experienced, sane and equally courageous oldsters. Both groups are putting life and meaning into the slogan which has been bandied back and forth by dentists for a number of years—"Enter bolus, exit balance."

When balance exists, so also does condylar guidance. The necessity for continued health and preservation of oral tissues places anatomic tooth forms in the exit doorway, ready to be shoved out. The stamp of approval is now faintly embossed on nonanatomic forms, but it is sufficiently plain for all concerned in the preservation of edentulous ridges to see and adopt. The concept of functional occlusion of artificial dentures now in its early stage of development and acceptance is that predicated on the cyclic chewing stroke and the neuromuscular control of the mandible through the tactile sense. It is fortunate that the required research and clinical testing of this concept is sufficiently advanced to dovetail with the newer philosophy of health service of complete denture treatments. Other advantages are the simplification of procedures and the reduction of over-all costs which dovetail with the need for economy of the postwar era.

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*Significance of Faulty Health Habits.*—In a recent demonstration, 735 executives and employees of the Blue Cross were asked, "Have you any health habits that impair your health?" Only five answered in the affirmative, yet when their daily programs of activity were checked, including the time when not at work, an average of 3.1 faulty habits was found. When the significance of these faulty habits was explained and suggestions were made for their correction, they made a total of 2822 return visits for help in correcting them.

Eighty-eight cases in the danger zone of overweight lost from one to 28 pounds—a total of 574 pounds.

Eighty-eight cases in the danger zone of underweight gained from one to 15 pounds—a total of 247 pounds.

Fourteen patients with systolic pressure ranging from 150 to 210, were found at the end of the period of their return visits to have reduced their systolic pressure an average of 20.

Of the 735 applicants examined, 110 had no physical defects aside from overweight and underweight. None was entirely free from faulty health habits.

Twenty-seven per cent were referred to their family physicians, and 17 per cent to their family dentists.

A check-up of their 24-hour period of activity showed that faulty health habits were occasioned chiefly by conditions outside rather than during working hours.—*Wm. R. P. Emerson, "A New Approach to the Problem of Impaired Health," Indust. Med. 18:159, April 1949.*

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## EDITORIALS

### ARMY DENTAL CORPS BILL (S. 1205) MEETS FORMIDABLE OPPOSITION

THE Army Dental Corps bill, S. 1205 (and its companion bill, H.R. 3479), sponsored by the Association, has encountered another formidable, but not unsurmountable, obstacle. Representatives of the Department of the Army and the office of the Secretary of Defense, testifying recently before the Armed Services committees of both houses of Congress, voiced their opposition to it.

The long hard fight which the Association has made to raise the status of the Army Dental Corps in order to assure the highest type of dental service to Army personnel is known to every member of the profession—particularly to those who have served in the armed forces.

During the early days of the late war strenuous efforts were made to remove, through legislation, the many inequalities to which army dental officers were subjected. Army officials, acknowledging the existence of these inequalities, proposed that they be corrected through revision of regulations rather than through legislation. The enactment of statutory measures in the midst of a world war, officials cautioned, would be inimical to national welfare. Averse to committing any act that might contribute to enemy success, the Association accepted the Army's proposals. Regulations governing the conduct of the Army Dental Corps were revised, but the new regulations remained in force for less than a year. They were again revised and the corps returned to its former untenable status. Insistent demands of the Association caused the Army Medical Department to re-revise regulations so as to restore a semblance of authority to the Dental Corps. These "off agin, on agin, gone agin" tactics reconfirmed the Association's contention that so long as regulations can be revised at the whim of a few brass hats the structure of the Army Dental Corps would rest,

inevitably, on an insecure foundation. Under existing conditions no commanding officer can be expected to build an effective organization, attract efficient personnel and develop an "esprit de corps" so essential to the high quality dental service which the government has promised those who elect to serve in the Army.

Early this year, conferences between representatives of the Association and Army officials elicited a statement from Army Surgeon General Raymond W. Bliss that he had no personal objection to the Association's legislative efforts to achieve authority commensurate with responsibility for the Army Dental Corps. Top ranking officials, however, do not concur in the General's opinion. Gordon Gray, Secretary of the Army, in a letter to the Armed Services committees of both branches of Congress, opposed S. 1205 on the ground that it would "tend to fix by statute the duties and powers of a particular corps within the Army." Such a tendency, he said, is contrary to the recommendations of the Hoover Commission, and is at variance with what are considered sound principles of organization within executive agencies.

The Army, through the Army Comptroller's office and the Management Engineer, has indicated a willingness to cooperate administratively in an effort to accomplish the purposes of the Association insofar as those purposes can be attained within the framework of the general staff's present plans for the control of personnel and subordinate establishments. These assurances, no doubt, were made in good faith, but they cannot be considered seriously. Past experience has proved that assurances governed only by regulations can be negated easily by revisions. Only through statutory measures will the rightful status of the Army Dental Corps be assured.

The Association, despite the opposition of the Army and the office of the Secretary of Defense, will continue to press vigorously for the enactment of the Army Dental Corps bill. The Council on Legislation and the Council on Federal Government Dental Corps have done an excellent job in presenting dentistry's cause to Congress. They are faced, however, with a formidable opponent which persists in standing in his own light. The Councils need assistance. State and component dental societies and all others that are interested in improving dental service in the Army should write to members of the two Armed Services subcommittees,[1] urging a favorable report on the bill. Congress must be convinced that S. 1205 was conceived and written in the interest of the military patient and must be enacted in the best interest of national defense.

1. Members of the Senate and House Armed Services subcommittees are listed on page 211 of this issue.

## ADVERTISERS TAKE ADVANTAGE OF EXPERIMENTAL STATUS OF AMMONIATED DENTIFRICES

THE amazing and, if health were not concerned, almost amusing war of words now being waged by the advertising agents of certain dentifrice manufacturers has precipitated concern in the ranks of the dental profession and confusion in the minds of the public. Whether ammoniated dentifrices will prove as effective in sweeping away caries as their advertisers have been in sweeping the country with

glowing claims, time alone will tell. Meanwhile the public will have the privilege of being guinea pigs, the dentist will be extremely cautious in his recommendations and the purchaser will brush his teeth with tongue in cheek if such is physically possible.

True, some scientific evidence has been presented by the formulators of certain ammoniated dentifrices to indicate that in preliminary studies their use has reduced the number of lactobacilli in saliva and partially controlled the progress of caries. The modest reports of the researchers, however, and the evidence which they have produced to date does not warrant many of the claims and implications presented by the advertising geniuses whose duty it is to sell their clients' products.

Members of the dental profession view the national advertising campaigns of ammoniated dentifrices with mixed emotions. Their hope that the use of the new formulas will control, partially at least, the destructive action of caries is tempered by apprehension lest their promised effectiveness prove as disappointing as have previous dental panaceas. Dentists will not forget soon the blind faith and overconfidence which both the profession and the public placed, some twenty-five years ago, in the axiom that a clean tooth never decays. Nor will dentists forget soon the promise that lay in vitamins and the years of earnest effort which they spent in trying to control caries by that means.

In light of these rather recent unpleasant and embarrassing experiences it is understandable why the profession, in accepting the cautious statements of the scientists who conceived the ammoniated dentifrice formulas, refuses to accept willy-nilly the broad assertions and implications of those who would market them.

The profession, rightfully, will withhold judgment on ammoniated dentifrices until clinical trial and carefully controlled studies have proved their worth. Fortunately several such studies are now in progress. One is being conducted on 1,900 school children in a midwestern city under most favorable conditions. The data from this study, which will not be available for at least a year, should provide better evidence for or against the case of ammoniated dentifrices. In the meantime the best that can be said about the promotional activities of the large number of firms that are now, or that soon will be, vying for the ammoniated dentifrice market is that their advertising should stimulate the increased use of the toothbrush and further improve the mouth hygiene habits of the American people.

## STATUS OF PUBLIC HEALTH DENTISTRY SERIOUSLY IMPAIRED BY CHANGES IN MICHIGAN HEALTH DEPARTMENT

PUBLIC health dentistry received a serious setback early this year when those responsible for the reorganization of the Michigan State Department of Health reduced its dental unit from a second to a third administrative level.

For a third of a century the Bureau of Dental Hygiene, established through the cooperation of the Michigan State Dental Society, has functioned as a division of the

Department of Health. The Chief of the Bureau was responsible solely to the Commissioner of the Department. Under the new arrangement the Bureau becomes the Section of Public Health Dentistry in the Division of Local Health Services, and the Chief of the Section is responsible to the Director of the Division who, in turn, is responsible to the Commissioner.

This backward step means that eventually, if not now, the formulation of policies and the administration of public dental health activities in Michigan will be the responsibility of an executive unversed in the problems of dentistry. Assuredly such an arrangement is not in the best interest of the public.

While the dentists in Michigan are concerned over the revised status of their state dental unit they are more concerned over the manner in which the revision was brought about. Reorganization was effectuated without consulting the Michigan State Dental Society, which body was responsible for the establishment of the Bureau. Through the years the Society has maintained close working relations with the Department and has demonstrated its ability and willingness to further public health within the state. Under existing conditions it is conceivable that the excellent health services formerly rendered to the citizens of Michigan will be seriously impaired.

The dictatorial manner in which public health dentistry was relegated to a minor position in Michigan is suggestive of the attitude and actions of Aneurin Bevan of Great Britain, and is indicative of what may be in store for dentistry should government officials gain control of health services.

# INTERNATIONAL CORRESPONDENCE

## NEWS FROM GREAT BRITAIN

The National Health Service reached its first birthday on July 5 and it is perhaps now worth while to take stock of dentistry's present position in Great Britain. It has been an important year; probably the most momentous in the history of British dentistry for this year's events will cast long shadows into the future.

The Service started on July 5, 1948 with about 5,000 dentists or about 50 per cent of the dentists in general practice enrolled. Today over 90 per cent are in the Service according to the latest available figure of 9,347 released on May 1. Today British dentistry is state dentistry.

After an initial period of uncertainty lasting about three or four months, the public seemed to settle down to the idea of state dentistry. The uncertainty probably was due to the fact that prior to July 5 there had been no widespread clamor for free dentistry. Under the old National Health Service the patient had to pay a part of the cost of treatment so that something entirely "free" was, therefore, something to be accepted with caution. In as much as the scale of fees was generous and far better than had been forecast, the practitioner also contributed to the transition from private to state practice. The payment was certain and prompt once the scheme was organized, and there is no doubt that many patients were encouraged to have treatment under the scheme.

By September the Service showed signs of settling down. Patients and dentists were back from vacation, and the rush commenced. Enrollment of dentists in the Service rose steadily as did the number of patients seeking dental treatment. The dental "boom" of the winter of 1948-49 will long be remembered.

The Spens Report had been forgotten. It had recommended that 33 chairside hours per week should be the average working week of a dentist. By October the majority of dentists were working harder and longer hours than ever before. A considerable number of them also were earning incomes much higher than ever before.

For the patient, however, things had become difficult. Although he was no longer required to pay for dental treatment, he could no longer get it when he wanted it. Dentists' appointment books were filled up for weeks ahead. In the early months many tried to cope with the increase in patients seeking treatment but despite all their overtime they soon realized the impossibility of the task.

The sufferer from toothache was a sorry plight. In addition to his continuing pain, he was annoyed by not getting that to which he was entitled; namely, dental treatment. Letters appeared in the newspapers, questions were asked in the House of Commons. Apart from the long waiting lists, explanation could be found in the fact that these patients had no regular dentist and consequently no one regarded the sufferer as his patient. Secondly, there was the form. Even if a patient just wanted an aching tooth extracted the dentist had to complete the standard form which required the charting of every tooth, every cavity and every filling. This examination took about twelve minutes and was irksome to many even though they received an examination fee. Now a simple form has been introduced and most dentists are complying with the Health Minister's wish that a period each day be set aside for these emergency patients.

With all this work in hand it soon became common talk that dentists were being paid "fortunes." This talk looked more like fact than gossip in December when the Minister of Health introduced the regulation limiting dentists' earnings at the standard rate to £400 ($1,600) per month and £4,800 ($19,200) per year. This latter figure, however, represented gross income and no publicity was given to the fact that it only was comparable to a net income of about £2,300 ($9,200). The Spens figure had been £1,600 ($6,400) net at 1939 rates. The £4,800 figure stuck in the public mind and became the yardstick for all other salaries from Cabinet Ministers to message boys. Both the public and some physicians seemed to grudge the dentists their income.

It is difficult to be certain that the introduction of the limiting regulation had any marked effect in cutting down the rising dental costs to the state. Certainly the effects could not be manifest for some months as all work contracted for before Feb. 1 was exempt from the cut and many dentists were booked with appointments till April and even May. The initial estimated cost of the dental service was £7,000,000 ($28,000,000), but it became apparent by February that the cost would be closer to £30,000,000 ($120,000,000).

The demand for state dentistry boosted the need and demand for both professional and lay dental assistants. Professional dental assistants were being offered £1200 ($4,800) to £1500 ($6,000) a year in addition to many other inducements such as bonuses. In 1939 a newly graduated dentist could expect an assistantship at about £350 ($1,400) a year while today he may earn at least £1000 ($4,000). Wages offered to lay personnel have risen in proportion. Secretaries and dental nurses are never out of employment. Dental mechanics who in 1939 were paid about £5 ($20) to £6 ($30) per week now command at least £15 ($60) per week and usually earn much more through bonuses and overtime work.

The demand for assistants soon attracted those dentists available but many vacancies still existed. It was these vacancies that ruined the school dental service. It did not take long for school dentists to see that the negotiations for increases in salaries to come within the range stated in the Spens Report were going to take a long time to get going. Consequently the tempting offers of assistantships at much higher salaries were readily accepted. The income of a school dentist was in the range £600 ($2,400) to £850 ($3,400). During the winter resignations from the school dental service reached the point where some local authorities found themselves with only one or two dentists on their staff and many dental clinics had to be closed. Some local authorities increased dentists' salaries but they were handicapped by the need to preserve a balance among the various departments of their staff. To many it seemed ironical that the government's declared priority classes for dental treatment—school children and expectant and nursing mothers—were the ones most to suffer in the new service, as it was entirely responsible for the collapse of the service that had been specially built up for them over the years.

Dental teachers have had to face up to the same realization that financially their job is not so remunerative as general practice. The new service has introduced, however, a most important and welcome feature for this group. It is the official grading of a number of dental surgeons as specialists, and, what is equally important, these specialists have equal status with medical specialists. The value of this move lies in the fact that in the future dental specialists will have to go through a period and style of training similar to that required of surgeons and physicians. Consequently, planned training facilities will now become available for those wish-

ing to become dental specialists. The salaries and rates of pay for specialists only recently have been announced and physicians and dentists have been advised by their respective associations not to sign the contracts till further points have had official explanation and interpretation. Certain hardships have come to light in addition to the disappointment that many experienced when they found that the Regional Hospital Boards or the Governors of Teaching Hospitals had not graded them as specialists. There is a small group of practitioners, mostly orthodontists, whose practice is confined entirely to orthodontics yet they have no hospital appointment and are not graded because only those holding hospital appointments can be regarded as specialists.

The wound that was reopened by the Minister's decision to impose a ceiling on fees has been further aggravated by his imposition of a temporary scale taking effect from June 1. This has led to a number of resignations from the service. In some places this decision has been taken as a group and in West Bromwich, Dudley, Whitley Bay and a number of other towns all the dentists have intimated their intention of resigning from the service on the expiry of the three months' official notice.

It was expected that this first year would close on a note of excitement with the publication of the findings of the Penman Committee which is calculating the average time taken to perform the various dental operations. This report, however, will not be available until August.

In this brief survey the effect of the National Health Service on the patient, the general practitioner and his lay and professional assistants have been considered. The disturbing influence it has had on the school dental service and the important benefit conferred upon the profession by the grading of specialists have been noted. Finally its effect upon the British Dental Association is to be mentioned.

When the announcement of the new scale of fees was made all eyes turned to the B.D.A. In the past the Association has been unfortunate. It has negotiated with the Minister of Health under the most difficult circumstances. It has taken decisions considered to be in the best ultimate interests of the profession and it has had in consequence to ask its members to act contrary to their financial interests. Twice it has issued strong directives and twice its members have failed to support it. On the first occasion it asked members to refuse to do N.H.I. work after the failure of the negotiations in autumn 1946. The second occasion was when it advised its members to stay out of the service on July 5. On both occasions, opposition to the government collapsed. The B.D.A. has taken no official action in opposition to the new fee scale, saying only in an official statement that the matter is left in the hands of the individual practitioner. Despite mass resignations in a few places this declaration indicates that the National Health Service offers a satisfactory practice in dentistry for a very considerable number of practitioners in Britain today.—*John R. Boyes, New Castle Upon Tyne.*

## THE NATIONAL SCENE

### from The Journal's Washington Correspondent

Notwithstanding the fact that July was perhaps the slowest month of this session of Congress, as far as the march of health and dental legislation were concerned, the signs that begin to appear every year about this time are again evident. To wit, an eleventh hour drive for enactment of several major bills is in the making, with its Congressional leaders hopeful of success before the curtain is rung down on this first session of the 81st Congress.

Meantime ambitious bills, many of direct concern to the dental profession, continue to be introduced, though their sponsors realize that the best they can hope for is early consideration in 1950 after convening of the second session. For example, on July 13 Senator Clyde R. Hoey (D., N.C.) introduced A.D.A. sponsored S.2248 and S.2249, designed to give dentistry professional parity with medicine in the Veterans Administration at the request of Clyde E. Minges, A.D.A. president.

During the past month, both the Senate and the House subcommittees on health legislation completed separately conducted public hearings, although the House group left the door open for one more session to hear testimony in support of the Flanders-Herter omnibus bill (mentioned in this space last month). At press time, the two subcommittees, whose chairmen are Senator Murray and Representative Priest, respectively, were busily engaged in framing recommendations to Senate Labor and Public Welfare Committee and House Interstate and Foreign Commerce Committee.

Indications were that the Senate conferees would give priority to federal-aid to medical and dental education, expansion of the Hill-Burton hospital construction law and increased government support for local public health units. Their counterparts on the other side of the Capitol were devoting particular attention to initiation of a federal-state school health services program, broadening of federal responsibilities in medical research and amendment of the Hill-Burton Act. The Senate has already passed the school health services bill, which authorizes allocation of $35,000,000 annually to the states for preventive, diagnostic and—in certain cases—therapeutic services for children between ages of 5 and 17.

#### Research Building Plans

Public Buildings Administration has begun to draw up specifications for the National Dental Research Institute building, under a $100,000 appropriation earmarked for this purpose in the Public Health Service funds bill for 1949-50 which was signed by President Truman on June 29. The appropriations bill also increased by $160,000 the funds available for dental public health activities, the bulk of which will be needed to continue topical fluoride demonstrations throughout the states during the ensuing year. In the field of oral research, $200,000 was provided, compared with $157,000 available during the fiscal year that ended June 30. The latter sum is to be used for grants-in-aid to individuals and dental schools and other institutions, being exclusive of research appropria-

tions for intramural studies at the National Institutes of Health. Incidentally, Francis A. Arnold, Jr., became assistant director of the research institute, effective July 1.

### V.A. Dental Care Threat

Anxiety is being shown in certain Washington quarters over a peculiar situation in Veterans Administration which threatens to offset gains made in recent months in reducing the backlog of applications for outpatient dental care. An estimated 20 per cent of the Civil Service dentists engaged in claims and adjudication duties at VA regional offices have been discharged due to retrenchment necessitated by sharp budget cuts. These dentists are not part of, or responsible to, the Department of Medicine and Surgery of Veterans Administration.

In some cities, however, Department of Medicine and Surgery dentists have had to be pressed into service to perform adjudication and rating tasks, thus bringing about the undesirable situation in which the dentist functions as both a judge and clinician, so to speak. But perhaps the gravest consequence is the effect, already being felt, of slowing down the handling of approved applications.

### Education Practices

Representative Fred L. Crawford (R., Mich.) delivered a five-minute speech on the House floor July 13 strongly criticizing educational practices which, he said, are denying thousands of young Americans the right to study dentistry, medicine, law and many of the other professions. His particular target was the academic training prerequisite to matriculation in professional schools.

"The professional educators have run hogwild on the subject of academic degrees, freezing out of the professions hundreds of thousands of young men and women who are thus denied their right to social and economic advancement," he declared. "Aside from the personal hardships worked on the individuals, this trend has blocked our national progress in most of the professions."

### Dental Research Grants

Award of $160,708 in dental research grants for 25 projects at 16 institutions in eight states and the District of Columbia was announced July 18 by Federal Security Administrator Oscar Ewing. All are continuation grants. Largest single item is $19,278 for continuance of studies by the University of Chicago, under J. R. Blayney, on fluorination of a communal water supply in Evanston, Ill., and its effect on reducing the incidence of dental caries.

Other recipient institutions are as follows:

University of California, Howard University, Northwestern University, University of Illinois, Indiana University, Harvard University, Tufts College, Michigan State University, University of Michigan, St. Louis University, University of Kansas City, Columbia University, Eastman Dental Dispensary, New York University and Meharry Medical College.

The grants program is administered by the division of research grants and fellowships of the National Institutes of Health. The awards were approved by Surgeon General Leonard A. Scheele following recommendations by the National Advisory Dental Research Council.

Subjects of research investigations receiving continued aid include pulp reaction to heat, antibiosis as a preventive factor in caries, studies of bone healing, caries-producing potentialities of edibles, etiology of periodontoclasia, amino acid deficiencies, relation of vitamin C blood levels to periodontal disease and relation of solubility to hardness of tooth enamel.

# LEGISLATION

## A.D.A. OPPOSES INCLUSION OF HEALTH AGENCIES IN PROPOSED FEDERAL WELFARE DEPARTMENT

President Truman's proposed Reorganization Plan No. 1, which calls for creation of a Federal Department of Welfare, under direction of the present Federal Security Administrator, was opposed by the A.D.A., July 21, during a hearing conducted by the Senate Committee on Expenditures in the Executive Department. Primary opposition voiced by the Association's spokesman, E. Harold Gale, of Albany, N. Y., member of the Council on Legislation, hinged on the lack of "direct relationship" between health and welfare services as set out by the President in his recent message to Congress on reorganization of the executive branch of the government.

The A.D.A. statement took issue with the proposal that the present Federal Security Agency, directed by Oscar Ewing, the administration's most active agitator for compulsory health insurance, should control the Public Health Service. The plan "violates a fundamental principle in good health administration in that it perpetuates the procedure of subordinating the Public Health Service to the lay control of the proposed Secretary of Welfare," Dr. Gale said. The hearing was a last-minute attempt to get Senate approval of the plan before Congress adjourns this session.

### Association Policy Cited

As long ago as 1938, it was stated, the A.D.A. House of Delegates went on record as being opposed to subordinating health administration to lay control either in or out of a federal department of welfare and recommended that a federal department of health be created with a chief administrator trained in one of the health professions. This department also would establish within it a Bureau of Dental Health to study more efficiently the causes and methods of control of a group of diseases which affect 95 per cent of the population.

### Plan Tie-Up Hit

The administration's apparent attempt to tie up the establishment of this new department of Cabinet rank with the recent Hoover Commission Report on reorganization of the government, also was hit by the A.D.A. representative.

"The Hoover Commission . . . recommended the transfer of existing health activities of the Federal Security Agency to a new agency to be designated the 'United Medical Administration,'" Dr. Gale pointed out, adding that the President, in his recommendation that the Reorganization Plan be approved, failed to mention the Hoover Commission recommendation. Mr. Truman, he said, "stated that other plans will be transmitted in the future to accomplish other unnamed recommendations of the Commission with regard to the Federal Security Agency." The plan "specifically subordinates the health activity to the lay administrator" under the President's proposal, the spokesman charged.

In a skeptical vein, the A.D.A. spokesman said that the Plan "essentially promotes the existing Federal Security Agency to the prestige of Cabinet status. It also continues in effect with enhanced prestige the only existing agency of the federal government which can provide the machinery to operate the Administration's compulsory health insurance scheme now before the Congress."

The A.D.A. is sincerely interested in current efforts of the President and Congress to "promote efficiency and economy through the medium of the Reorganization Act machinery but, while it is true that a degree of efficiency can be obtained by combining a number of agencies under a single head, there must be some direct and logical connection between the agencies so assembled," the statement said, adding that the fact that the Public Health Service presently is under control of the Federal Security Agency is not "sufficient reason to justify continuance of the relationship under this Plan."

### A.D.A. COUNCIL URGES ACTIVE SUPPORT FOR DENTAL CORPS BILL

Following completion of testimony on the A.D.A. sponsored Army dental bill designed to create "authority commensurate with responsibility" for the Army Dental Corps, late in June, the Council on Legislation urged all A.D.A. members to write the Armed Services Committee of both the House and Senate requesting favorable consideration for the bill (S. 1205 and H.R. 3479).

Democratic members of the Senate Armed Services Committee are: Millard E. Tydings, Maryland, chairman; Richard B. Russel, Georgia; Harry F. Byrd, Virginia; Virgil Chapman, Kentucky; Lyndon B. Johnson, Texas; Estes Kefauver, Tennessee; Lester C. Hunt, Wyoming; J. Allen Frear, Jr., Delaware; and Paul H. Douglas, Illinois. Republican members on the Committee are: Charles W. Tobey, New Hampshire; Homer E. Capehart, Indiana; Ralph E. Flanders, Vermont; Harry P. Cain, Washington; and John W. Bricker, Ohio.

In the House Armed Services Committee, Democratic members are: Carl Vinson, Georgia, chairman; Overton Brooks, Louisiana; Paul J. Kilday, Texas; Carl T. Durham, North Carolina; Lansdale G. Sasscer, Maryland; James J. Heffernan, New York; L. Mendell Rivers, South Carolina; Philip J. Philbin, Massachusetts; F. Edward Herbert, Louisiana; Arthur Winstead, Mississippi; Franck R. Havenner, California; Melvin Price, Illinois; O. C. Fisher, Texas; Porter Hardy, Jr., Virginia; William J. Green, Jr., Pennsylvania; Clyde Doyle, California; Edward deGraffenried, Alabama; John R. Walsh, Indiana; L. Gary Clemente, New York; E. L. Bartlett, Alaska; and A. Fernos-Isern, Puerto Rico. Republican members are: Dewey Short, Missouri; Leslie C. Arends, Illinois; W. Sterling Cole, New York; J. Parnell Thomas, New Jersey; George J. Bates, Massachusetts; Paul W. Shafer, Michigan; Charles H. Elston, Ohio; Jack Z. Anderson, California; William Blackney, Michigan; Leroy Johnson, California; Harry L. Towe, New Jersey; Leon H. Gavin, Pennsylvania; Walter Norblad, Oregon; James E. Van Zandt, Pennsylvania; and Joseph R. Farrington, Hawaii.

Francis J. Garvey, Council secretary, pointed out that even though the bill may not be acted upon during this session, favorable committee action could aid in bringing about early consideration at the next session.

## A. D. A. AFFAIRS

### FIRST A.D.A. CONFERENCE ON LIBRARY AND INDEXING HELD

A more scientific approach to problems in dental nomenclature and the development of a simpler system of classification of the profession's literature were two of the main topics discussed by more than 40 persons representing 23 dental libraries and four related groups at the first A.D.A. sponsored Conference on Dental Library, Indexing and Nomenclature problems, held at the Central Office, June 27.

Planned by John E. Gurley, chairman of the Advisory committee to the A.D.A. Bureau of Library and Indexing Service, and Donald A. Washburn, Bureau director, the conference was exploratory in nature and no formal recommendations were considered. The relation of the A.D.A. library with those of dental schools, the development of a union catalog of dental library holdings and a discussion of classification were major topics during the first half of the meeting, presided over by Thomas D. Speidel, of the University of Minnesota dental school.

Dental nomenclature, indexing and new technics for reproducing dental indexes occupied prominent positions in the afternoon discussions which led finally to a summary of the entire conference by Harold Hillenbrand, secretary of the A.D.A. The afternoon session was under the direction of Dr. Washburn. Visitors from Canada and Venezuela were present at the conference.

## COUNCIL ON DENTAL HEALTH TO AID IN DEVELOPING PRIORITIES FOR CHILD HEALTH CARE

Preparation of an advisory statement relative to priority of health services for children under the $35,000,000 grants-in-aid school health services bill, now before Congress, and establishment of adequate community health programs throughout the nation were among the major problems faced by the Council on Dental Health, when it met in Chicago, July 9-11.

In connection with the school health services measure, the Council agreed to work with the American Academy of Pediatrics in the development of priorities for treatment and care of children. Because of the limited funds provided in the bill, it was suggested that first consideration be given to children with physical handicaps which interfere with learning. The joint statement to be submitted to the Board of Trustees and House of Delegates is expected to stress diagnosis and treatment of defects in vision, hearing, speech and dental defects such as anomalies and injuries of the mouth, Allen O. Gruebbel, Council secretary said.

Establishment of additional, sound community health programs probably will be emphasized by the joint committee according to Leo J. Schoney, New Orleans, Council chairman, who told the Council that such programs would go far toward counteracting enactment of compulsory health insurance. The school health bill (S. 1411 and H.R. 3942) already has passed the Senate and is expected to be given favorable action in the House.

According to Dr. Gruebbel, both the Academy and the Council agree that provision of health service should be administered by health agencies and provision of educational services, in a school health program, should be made by qualified education agencies.

The Council's immediate concern with the over-all national dental health picture was apparent from the agenda which covered eleven phases of health planning.

Preparation of a special report for the Board of Trustees on the so-called "dental nurses" plan, also referred to as the New Zealand plan, wherein a subprofessional group provides limited dental services for children, was authorized by the Council. Renewed concern over the New Zealand plan stems from recent agitation in favor of permitting the "dental nurses" to practice in Puerto Rico and the United States.

A representative of the U.S. Public Health Service who discussed the gov-

ernment's demonstration program on the topical application of sodium fluoride currently being conducted in 32 states heard the Council reiterate the Association's opposition to the continuation of the program as it presently is being carried out. The A.D.A. has urged that all such programs be placed on a grants-in-aid to states basis.

### Rehabilitation Studied

Two members of the federal Office of Vocational Rehabilitation, Thomas B. McKneely, chief medical officer, and Donald H. Dabelstein, assistant director of the agency, also met with the Council and A.D.A. trustee, William McGill Burns, member of O.V.R.'s National Professional advisory committee to discuss the provision of dental services in the rehabilitation program.

A special committee of the Council was set up to work with the O.V.R. in a study of the dental needs of vocationally handicapped people and it was recommended that state and local dental societies work in close cooperation with state rehabilitation agencies in similar studies at that level. The possibility of including a state dental consultant and a dentist member on state rehabilitation advisory committees also was discussed.

Among other problems considered by the Council was expansion of the A.D.A.'s program for National Children's Dental Health Day. Proposed new dates for the annual observance suggested by several dental societies were reviewed and it was decided to prepare a report for the House of Delegates on the advantages and disadvantages of fall and spring dates. Children's Dental Health Day now is held in February.

A proposal that the Council conduct two national dental health conferences in 1950 also was considered. The first such meeting would be for chairman of state dental society councils on dental health to discuss community dental health programs and the second for dental health education specialists. The latter conference, it was suggested, would feature discussions on preparation of a training program for teachers engaged in dental health education and on methods of improving the dental health education services of the A.D.A., state and local dental societies.

Recommendations that the Association undertake a number of long range studies designed to provide data for a comprehensive analysis of dental health problems also were weighed by the Council. Among the points which would be covered in the proposed studies are collection and analysis of information on dental personnel, community dental programs, distribution of services and the inclusion of dental services in health programs for schools, labor unions, industrial organizations, insurance plans and other groups.

In reviewing the status of the Veterans Administration dental service program, the Council agreed that the program is considerably improved and that the full cooperation of the V.A. has been achieved.

## COUNCIL ON DENTAL HEALTH EXPANDS EDUCATION MATERIAL

A new motion picture on the value of early dental care for children and the proper approach to the child's first visit with the dentist is now being distributed through the A.D.A. Council on Dental Health. A new series of pamphlets and booklets on dental care also are available.

The film, titled "Your Child's First Visit to the Dentist," prepared under the auspices of the Chicago Dental Society, illustrates the proper and improper approach by the parent of a child on its initial meeting with the dentist. Characters used in the film are actual patients.

A new booklet titled "Dental Caries: Prevention and Control" is designed for

use among parents, teachers, health workers and others interested in child health. The importance of early and frequent examination, early preventive measures, treatment of cavities, home care of the mouth and a balanced diet are stressed.

Two pamphlets which have been revised also were produced recently. They are "The Care of Children's Teeth," a series of questions and answers, and "X-Rays and Your Teeth." Both pieces are designed for use by parents and teachers.

The dental health education record albums produced by the Southern California State Dental Association and distributed by the A.D.A. will be reduced from $15 to $10 each on September 1. These records feature the voices of several movie stars.

## JOURNAL OF ORAL SURGERY TO FEATURE SECTION ON PATHOLOGY

The Registry of Dental and Oral Pathology, which operates under the auspices of the A.D.A., now is sponsoring a section on surgical oral pathology in the *Journal of Oral Surgery*. All announcements and data relative to the Registry will be made through the *Journal*, according to Lt. Col. Joseph L. Bernier, secretary-pathologist of the Registry.

## A.D.A. MEMBERSHIP EXPANSION PROPOSED AT COUNCIL MEETING

Expansion of the A.D.A. membership program through supplying state dental society secretaries with lists of non-members and the development of promotional literature was proposed during the meeting of the Council on Membership, at the Central Office, June 20. Active membership in the Association, on June 1, was slightly less than one per cent lower than that of the same date last year.

Under the chairmanship of Holly C. Jarvis, of Cincinnati, the Council also considered a proposal to raise student member dues from the present $3 to $4 to help cover the increased cost of mailing THE JOURNAL. Student memberships have more than doubled last year's total and current postal regulations exclude second-class mailing of THE JOURNAL when the membership dues are less than half of the subscription price. The Council plans to take the matter to the Board of Trustees in October.

## W. R. ALSTADT APPOINTED TO COUNCIL ON LEGISLATION

W. R. Alstadt, of Little Rock, Ark., has been appointed a member of the Council on Legislation to serve until the House of Delegates elects new Council members in October. The ad-interim appointment was made by Clyde E. Minges, A.D.A. president, following the death of the Council chairman, Carl O. Flagstad, June 16. Appointment of a new chairman has been deferred until the Board of Trustees meets just before the 90th annual session.

Dr. Alstadt, a veteran of World War II and a long-time member of the Association, has been serving the Council as a consultant. He recently testified before the Armed Services Committees of both branches of Congress on the A.D.A. sponsored bill to create "authority commensurate with responsibility" for the Army Dental Corps.

## JANUARY-JUNE INDEX TO A.D.A. JOURNAL AVAILABLE

The semiannual index to THE JOURNAL for the period covering January through June, 1949, is now available from the Bureau of Library and Indexing Service. The new index contains listings for each issue, and is available by writing the Bureau, 222 E. Superior St., Chicago 11.

This new exhibit on dental health education prepared by the A.D.A. Council on Dental Health, will be displayed officially for the first time at the 90th annual session, to be held in San Francisco, Oct. 17-20. Plans are being considered to make it available to all national, state and local dental organizations for display. This is the first of several exhibits which are planned by the Council. The exhibit is sixteen feet wide, but can be reduced to eight feet.

# AUXILIARY DENTAL AIDS, FEDERAL INTEREST IN DENTAL EDUCATION AMONG TOPICS AT COUNCIL MEETING

An examination of the structure of dental hygiene education and many of the rapidly multiplying problems in dental education was made by the Council on Dental Education in a series of meetings held in Chicago June 29 through July 3. Many of the matters discussed have recently received national attention owing to the introduction of federal aid measures in Congress.

The need for obtaining definitions and policies in the field of dental hygiene was the major topic discussed at the first Conference on Dental Hygienist Training sponsored by the Council. Some 80 representatives from the American Association of Dental Schools, the American Association of Dental Hygienists, the U.S. Public Health Service and other organizations directly connected with dental hygiene education attended the two-day meeting.

## Advice on Hygiene Heard

Since the Conference was advisory in nature, the Council considered a proposed "definition of the function of dental hygiene education" written during the meeting by a committee composed of both dentists and hygienists. The following definition resulted from the Council's deliberations:

"The prime function of the dental hygienist is to assist the members of the dental profession in providing oral health care to the public. She may apply her knowledge and skills either in the office of the private practitioner, or in formal health educational activities in schools or other agencies. In either instance, she can and should perform an important function in health education.

"The intra-oral operations performed by the dental hygienist shall be limited to the natural and restored surfaces of the crowns of the teeth or of the supporting adjacent tissues.

"At the discretion of the dentist, the dental hygienist may be required to perform other important office duties for which her training in the hygienist school may have prepared her.

"The present two-year course seems adequate to prepare the dental hygienist to perform the tasks that may be assigned to her in the private dental office. When employed, however, by a school system or any other agency, she should be required to extend her education to qualify her to assume such responsibilities."

It also was determined at the Conference that schools of dental hygiene currently are presenting a broad variety of subjects through widely varying types of curricula, at least partly because of the diverse duties of the trained hygienist in dentistry.

In connection with federal-aid to dental schools, the Council studied a resolution passed by the American Association of Dental Schools which approves of federal aid in "principle" provided adequate safeguards against undue governmental interference are included in any legislative measure. Final action on a possible A.D.A. stand awaits the decision of the Board of Trustees and the House of Delegates when they meet during the 90th annual session, in San Francisco, Oct. 17-20.

## Five School Studies Presented

A five point request for information on the needs and facilities of the nation's 39 approved dental schools also was presented to the Council by the A.A.D.S. The areas to be studied by the Council include (1) determination of the cost of education to dental schools per student per year; (2) determination of the aver-

age cost of dental education for the individual student exclusive of living expenses; (3) determination of the actual physical plant potential in all approved dental schools; (4) determination of the actual need for additional dental schools and expanded facilities to meet the demand for additional dental personnel; and (5) determination of the extent of the dental school teacher shortage by faculty rank and field of instruction.

The Council has for some time been planning a comprehensive study of the financial structure of the country's dental schools but definite action has been withheld pending the outcome of a similar study being conducted by the American Association of Medical Schools and the U.S. Public Health Service.

In the field of aptitude testing, the Council discussed plans for placing its testing program in nation-wide operation so that dental schools will have test data on their applicants in 1951.

Other Council business included consideration of the approval of additional dental specialties, specific educational requirements for specialty recognition proposed by the American Board of Oral Surgery and problems related to "dental nurses." Development of the conduct of the present program for the approval of dental internships and residencies was discussed with members of the Council on Hospital Dental Service during its meeting in the Central Office.

### COUNCIL WEIGHS LEGISLATION TO IMPROVE V.A. DENTAL STATUS

The advisability of proposing new federal legislation which would be designed to correct administrative inadequacies in the Veterans Administration dental service was weighed by the Council on Federal Government Dental Corps, at its meeting in the Central Office, June 16-18. Discussion centered largely on the dental service's lack of control of dental personnel, program operation, budget preparation and procurement of supplies.

Rudolph H. Friedrich, of Plainfield, N. J., Council chairman, said that the Board of Trustees would be apprised of conditions within the V.A. and other federal dental corps when it meets in October. It was agreed generally by the Council that additional information on federal dental services are needed. The possibility of conducting further studies into the organization, activities and administrative structure of the various dental corps was discussed.

## DENTAL EDUCATION

### FEDERAL-AID TO DENTAL EDUCATION APPROVED IN PRINCIPLE BY SCHOOLS' ASSOCIATION

A program of federal-aid to dental education which would be "surrounded by effective safeguards to insure the freedom and self-determination of the dental schools which may participate in it" was approved in "principle" by the American Association of Dental Schools meeting in Chicago, June 27-29. The Association also recommended that the A.D.A. Council on Dental Education conduct a series of studies on the needs and facilities of the nation's dental schools.

In defining the A.A.D.S. policy on federal-aid to dental education, an official statement said: "One of the most important considerations is the problem which arises as a result of geographic

distribution of the existing dental schools. This . . . distribution is not a planned arrangement but one which has resulted from a natural development stimulated by regional demands and local professional leadership." It also is pointed out that the 40 dental schools in the country are located in 24 states and that only 14 of those schools are controlled and supported by state governments.

"It is recognized that dental education as a whole is not adequately supported, and that some new source or sources of income must be made available so that dental education may continue to improve its quality in order to serve better the dental health of the public," the statement says, adding that although dental education has made "good progress" under "extremely limiting circumstances" the scarcity of qualified teachers and facilities has "reflected unfavorably upon the quality of instruction in almost all the dental schools of the country."

### Association Stand Justified

The statement says that the Association believes that federal funds might justifiably be appropriated to support "educational programs for dentists and dental hygienists provided that such support does not commit the dental schools of the country to any standard of education which the government might seek to impose."

The Association accepted the Navy Dental School, Bethesda, Md., and the dental division, Army Medical Department Research and Graduate School, Washington, D. C., as affiliate members.

Gerald D. Timmons, dean of Temple University dental school, was installed as president succeeding Roy J. Rinehart, dental dean at Kansas City University. Officers elected at the meeting were: Charles W. Freeman, dean, Northwestern University dental school, president-elect and Ernest G. Sloman, dental dean, College of Physicians and Surgeons, vice-president. John E. Buhler, dean of Emory University dental school was re-elected secretary-treasurer. Walter H. Wright, dean of New York University dental school, was named to succeed Dr. Sloman as a member of the executive committee.

## POSTGRADUATE ORTHODONTICS COURSE LENGTHENED AT BUFFALO

The postgraduate course in orthodontics being offered by the University of Buffalo dental school has been lengthened to cover three six-month semesters running consecutively over a period of one and a half years, according to Clifford G. Glaser, director.

Formerly, the course was given in one year, Dr. Glaser said, adding that applications for the class to begin in October are now being received. Additional information may be secured by writing the dental school, department of orthodontics, 219 Bryant St., Buffalo, N. Y.

## W. H. ALLEN IS NEW DEAN OF MEHARRY DENTAL SCHOOL

W. H. Allen

William H. Allen, who recently has been assistant dean of Meharry Medical College dental school, has been appointed dean to succeed Clifton O. Dummett. The appointment was made by the College's board of trustees and announced by M. Don Clawson, president.

Dr. Dummett has been granted an indefinite leave of absence from duties as dean and professor of dentistry at Meharry to become chief of dental service at

Tuskegee Veterans Hospital. He was appointed by Bion East, chief of dental service for the Veterans Administration.

Having served as acting dean for a year when Dr. Dummett was studying public health at the University of Michigan, Dr. Allen became the new dean officially on Aug. 1. He holds a B.A. degree from Tougaloo College, Tougaloo, Miss., and the D.D.S. from Meharry. He has taken postgraduate courses at the University of Michigan.

### MARQUETTE UNIVERSITY EXPANDS ITS CHILDREN'S DENTAL PROGRAM

Plans for expansion of Marquette University dental school's child dental care program were advanced recently with the school's acceptance of a $15,000 grant from the U.S. Public Health Service for the purchase of equipment.

O. M. Dresen, dental school dean, disclosed that needed new equipment will be installed in the dental school's existing dental clinic until the proposed addition to the school is erected. He also announced the appointment of John M. Frankel as director of the departments of pedodontics and dental hygiene. Dr. Frankel is a graduate of the University of Illinois dental school.

### DENTAL-MEDICAL BUILDING FUND NEARS HALFWAY MARK IN YEAR

Contributions toward a $5,750,000 fund raising program for construction of a new medical-dental building by Loyola University (Chicago) reached a total of $3,122,225 by mid-June, according to The Very Reverend Thomas T. Hussey, University president.

Stating that the amount so far collected more than meets the first year's goal, Msgr. Hussey urged campaign leaders to renew their efforts. It also was stated that 46 per cent of Chicago dentists are from Loyola's dental school.

## DENTAL SOCIETIES

### STATE DENTAL SOCIETIES CONSIDERING PLANS FOR FUTURE; ACTIVITY CENTERS ON C-H-I

With a heavy spring schedule of meetings and legislative activity behind them, state dental societies throughout the nation are settling down for the remainder of the summer to consider plans for the coming year. Some, such as the State Dental Society of New York, however, will devote added attention to informing members of their component societies on the necessity of continued vigilance against accelerated efforts by the proponents of compulsory health insurance before the Congress reconvenes.

Officers of the New York society are planning a "caravan" program which will take speakers of national reputation to special meetings of district dental societies throughout the month of September. Among those who have accepted invitations to discuss compulsory health insurance are Lon W. Morrey, editor of THE JOURNAL, and Francis J. Garvey, secretary of the A.D.A. Council on Legislation. They will speak on three consecutive days before groups in Manhattan, Brooklyn and Westchester.

Several state dental societies are continuing their programs to recruit members for their "special" trains to the 90th annual session of the A.D.A., scheduled to be held Oct. 17-20,, in San Francisco. The American Dental Hygienists

Association also is conducting a tour to the convention which is open to all members of the dental profession, according to A. Rebekah Fisk, executive secretary of that organization.

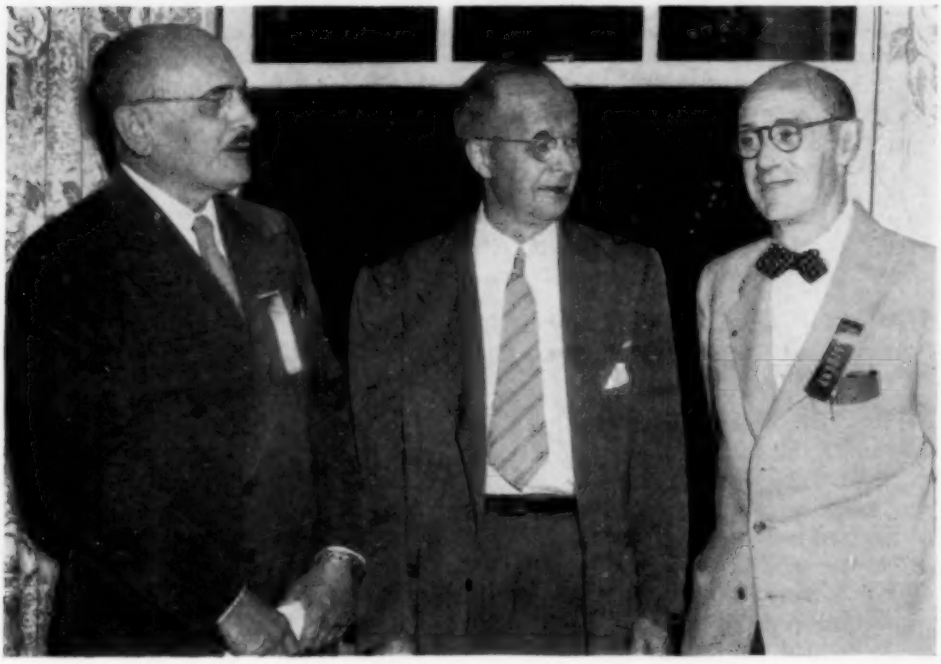
Before closing down for the summer, several state societies elected new officers for the year. Included in the list are:

*Connecticut.*—Louis R. Siegal, Hartford, president; Leon C. Monks, New Haven, president-elect and Ira Dow Beebe, Bridgeport, vice-president. Earle S. Arnold, West Hartford, was reelected secretary-treasurer.

*Maryland.*—B. Sargent Wells, Baltimore, president; Roger S. Schlosser, Hagerstown, president-elect; Max Baklor, Baltimore, vice-president; Samuel H. Bryant, Baltimore, treasurer and Harry B. McCarthy, Baltimore, editor. E. L. Pessagno, Jr., Baltimore, was reelected secretary.

*North Dakota.*—R. A. Sand, Fargo, president; Fred Maides, Grand Forks, president-elect and J. V. Troyer, Bottineau, treasurer. A. L. Smeby, Northwood, was reelected secretary.

*Virginia.*—Leon J. Walton, Roanoke, president; J. M. Hughes, Richmond, president-elect and J. E. John, Roanoke, secretary.



Dentistry's opposition to proposed national compulsory health insurance was the primary topic discussed by Harold Hillenbrand, secretary of the A.D.A., when he spoke recently at the Maine State Dental Society's annual meeting. Also present as an officer of the A.D.A. was Philip E. Adams, of Boston, president-elect (center), who is shown with Perley J. Lessard, Portland, new president of the Maine Society (right) and George S. Nevens, Damariscotta, immediate past-president.

# RESEARCH

## NEGATIVE TREND IN ANIMAL RESEARCH CAMPAIGN SEEN

Serious concern over the current negative trend in the legislative struggle for animal research and experimentation was evinced last month by the National Society for Medical Research. The bill involved would enable District of Columbia scientific institutions to utilize a portion of the 7,000 to 10,000 unclaimed and unwanted animals now destroyed annually in the District pound.

"Science will probably lose by default its present legislative battle against one of its most vocal and powerful enemies, the antivivisection cult," a release from the Society states. A. C. Ivy, secretary-treasurer of the organization, is reported as having said that the bill (S. 1703) "would probably remain in committee because scientists and the friends of science have failed to express themselves on the matter." It is believed that passage of the bill would be of "precedent-establishing" nature.

## RECORD AUDIENCE HEARS 120 REPORTS AT I.A.D.R. MEETING

More than 120 scientific papers on dental research were presented to a record audience at the 27th general meeting of the International Association for Dental Research, held in Chicago, June 24-26. Subjects discussed ranged from the application of water soluble chlorophyll derivatives to dental disease to patterns in cranio-dental orientation.

J. Roy Blayney, chairman of the A.D.A. Council on Dental Education and director of the Zoller Memorial Dental Clinic at the University of Chicago, was installed as president of the Association succeeding Allan G. Brodie, dean of the University of Illinois dental school. Basil G. Bibby, of Rochester, N. Y., was elected president-elect and Leonard S. Fosdick, of Chicago, was elected vice-president. Edward H. Hatton, of Evanston, Ill., was re-elected secretary-treasurer. Harold C. Hodge, of Rochester, N. Y. was elected a member of the Board of Trustees and it was tentatively decided to hold the next meeting at French Lick, Ind., March 29-31, 1950.

# PUBLIC HEALTH

## TWO TOP APPOINTMENTS MADE IN PUBLIC HEALTH SERVICE

In connection with the administrative reorganization of the U.S. Public Health Service, Oscar Ewing, Federal Security Administrator, reported early last month on the appointment of two top dental officers to new positions in the service.

Bruce D. Forsyth, an assistant surgeon general in charge of dental services in the Office of the Surgeon General, has been named an associate chief in the Bureau of Medical Services. Under the new arrangement he will continue to hold the title of assistant surgeon general and will be chief dental officer in U.S.P.H.S.

In the Bureau of State Services, John W. Knutson, who formerly was dental director of the Public Health Service, has been named chief of the division of dental public health.

The new arrangement, according to a Federal Security Agency report, is designed to bring "the functions of the Public Health Service into closely knit groupings within the respective areas of Service responsibility." It was stated that the changes were effected within the four existing bureaus and their divisions. The bureaus are: Office of the Surgeon General, Bureau of State Services, Bureau of Medical Services and the National Institutes of Health.

# ARMED FORCES

## AIR FORCE ESTABLISHES NEW MILITARY DENTAL SERVICE

In connection with the establishment of the new Medical Service of the Air Force, Brig. Gen. George R. Kennebeck, Air Force dental chief, has disclosed that a separate Dental Corps has been formed.

Personnel of the new Corps initially will consist of dental officers transferred from the Army Dental Corps, he said, adding that personnel transferred to the new Corps will be carried on a separate promotion list.

Other new corps being established within the Air Force Medical Service are the Dental Corps Reserve and the Dental Corps Air National Guard.

## DENTAL RESEARCH ADVISORY COMMITTEE CREATED BY ARMY

A dental research advisory committee to the Army Medical Research and Development Board has been created to advise the Surgeon General and the Board chairman on "policies relative to conducting basic dental research within the Department of the Army," according to Lt. Col. Joseph L. Bernier, chief, dental and oral pathology section, Army Institute of Pathology.

Membership of the committee, headed by Col. Bernier, is composed of six other Army officers and four civilian consultants. In addition to the chairman, the committee includes Lt. Col. John S. Ortell, assistant director, Army Dental School; Lt. Col. Kenneth C. DeGon, a dental representative on the Medical Research and Development Board; Lt. Col. Frank L. Bauer, a medical representative on the Board; Lt. Col. Walter J. Reuter, chief of dental service, Bolling Air Force Base and Capt. George W. Burnett, Dental Corps officer at the University of Rochester School of Medicine and Dentistry.

Civilian consultants to the committee include: George Paffenbarger, A.D.A. fellow at the National Bureau of Standards; Robert Kesel, professor of dentistry, University of Illinois; H. B. G. Robinson, professor of dentistry, Ohio State University dental school and Henry Swanson, chairman of the A.D.A. Council on Dental Museum and Registry.

## ARMY MEDICAL, DENTAL R.O.T.C. PROGRAM REVISION ANNOUNCED

The Army medical and dental R.O.T.C. summer camp program has been revised to permit students to spend more time on professional subjects and less time on strictly military subjects, the Army Surgeon General's office has announced.

Students must have had one year of active military service to come under the new ruling which allows for (1) the use of Army general hospitals instead of the Medical Field Service School for summer training; (2) the revision of training programs to place primary emphasis on military medicine, dentistry and surgery, and (3) the reduction of time devoted to essentially military subjects in the program.

## NAVY DENTISTS PAY TRIBUTE TO THE LATE CARL O. FLAGSTAD

The Navy Dental Corps, in requesting that "public acknowledgment of the great service . . . rendered the Navy and the dental profession" by the late chairman of the A.D.A. Council on Legislation, Carl O. Flagstad, asked that the text of an official letter signed by Rear Admiral C. V. Rault, assistant chief, Bureau of Medicine and Surgery (Dentistry) and chief of Dental Division, be published in THE JOURNAL.

The text follows: "I have just learned of the passing of Carl O. Flagstad. . . . On behalf of the Naval dental officers, I wish to express our grateful appreciation for the splendid service he rendered. The Naval Dental Corps is particularly indebted to him for his efforts on behalf of the Navy and his wise counsel and dynamic personality will be sorely missed by us." Dr. Flagstad died June 16 following preparation of testimony favoring the A.D.A.'s Army dental bill which was presented to Congress by the Council on June 20.

# INTERNATIONAL

## BRITISH DENTISTS FIGHT NEW HEALTH SERVICE FEE SLASH

A revolt among British dentists against the government's unilateral 20 per cent cut in the National Health Service fee scale was reported early last month. It is estimated that about 1,000 dentists out of approximately 10,000 participating in the scheme made the break.

While the British Dental Association, representing the three major groups of dentists in the country, has issued no official statement on the pay cut, it did inform its members that the health minister would not wait to revise the fee schedule until the time and motion study being conducted by the Penman Committee was completed.

According to a report made by the *Chicago Tribune,* the revolting dentists are refusing to provide government-paid treatment except in emergency dental cases.

It is known that negotiations between the dental organizations and the British government broke down when the Ministry of Health cut in half all dentists' gross incomes above £400 ($1,600) a month. Efforts at that time, however, resulted in appointment of the Penman Committee, headed by a layman, to study the dental fee scale with a view toward reevaluation after the Service had been in operation one year.

Meanwhile, however, the Chancellor of the Exchequer demanded immediate reduction in expenditures for dental service under the national health insurance scheme, according to Health Minister Aneurin Bevan. (See International Correspondence on page 205.)

## TWO U.S. DENTISTS AWARDED ROYAL COLLEGE FELLOWSHIPS

Joseph L. Bernier, chief of the Army Institute of Pathology, and Charles W. Freeman, dean of Northwestern University dental school, were awarded fellowships in the British Royal College of Surgeons last month.

Dr. Bernier, long active in the A.D.A. through the Registry of Dental and Oral Pathology, received his fellowship on July 15, as did Dr. Freeman. He was to address the College on carcinoma of the lip.

Dr. Freeman, who with his wife is touring England, Holland, Switzerland, France, Denmark, Norway and Sweden, will speak before the American Dental Society of Europe, on Aug. 2.

## ALL INDIA DENTAL SOCIETY HOLDS ANNUAL ELECTION

New officers were elected by the All India Dental Association at its recent annual meeting in Calcutta, according to N. N. Berry, international and public relations officer and new president-elect.

S. K. Majumdar, Calcutta, was elected president. Other officers elected were: R. Ahmed, Calcutta, R. Prakash, Dehra Dun, and H. D. Merchant, Bombay, all vice-presidents; S. Bratt, New Delhi, general secretary; P. L. Khurana, New Delhi, and N. C. Barory, Calcutta, joint secretaries; A. C. Nayyar, Delhi, and S. C.

Sen Gupta, New Delhi, assistant secretaries; P. C. Jayna, Delhi, honorary treasurer and R. Ahmed, Calcutta, editor.

### NINE ELECTED VENEZUELAN DENTAL SOCIETY TRUSTEES

The Colegio De Odontologos De Venezuela (Dental Society of Venezuela) recently elected Julio C. Alfonzo Vaz as president of its Board of Trustees. Other officers elected to the Board are: Pedro E. Henriquez, general secretary; Rogelio S. Velazco, Paul B. Silva, Victor Longobardi, Marcelo Cardier, Ibsen Araujo Lascano, Alfonzo P. Sader and Ricardo T. Semprun, departmental secretaries.

## GENERAL NEWS

### TWO DENTAL HEALTH MEASURES BECOME LAW IN CALIFORNIA

Two bills, one authorizing excusal of students from school for dental treatment and the other creating a division of dental health in the State Department of Health, have been signed by California's Governor Earle Warren. Both bills were sponsored jointly by the California State Dental Association and the Southern California State Dental Association.

### A.D.A. COUNCIL OPPOSES NEW DENTIFRICE PROMOTION

In a statement to THE JOURNAL, Thomas J. Hill, chairman of the A.D.A. Council on Dental Therapeutics, placed the Council on record as opposing a recent publicity campaign conducted by Rystan Co., Inc., of Mt. Vernon, N. Y., which recommends the general use of a dentifrice containing a chlorophyll derivative in caries prevention. The publicity campaign was based on a series of reports on the effect of a dentifrice and mouthwash containing these derivatives on the lactobacillus counts of 85 individuals. The reports were given at the International Association for Dental Research meeting, June 24, by Gustav Rapp and B. F. Gurney, of the faculty of Loyola University (Chicago) dental school.

"While these reports indicate the ability of both the toothpaste and mouthwash to reduce the number of lactobacilli in the oral cavity," Dr. Hill said, "the study contains no direct evidence on the effect of the preparations on dental caries." The news release distributed for Rystan received wide notice in the press and radio.

### A.M.A. REPORTS INCREASE IN NATION'S PHYSICIAN POPULATION

The physician population in the United States increased during 1948 by 3,367, according to a report of the American Medical Association's Council on Medical Education and Hospitals.

In the report made by Donald G. Anderson, of Chicago, Council secretary, and his assistant Anne Tipner, also of Chicago, it is stated that 6,597 physicians entered the profession in 1948 and 3,230 died in that year. No mention of retirements is made in an official news release on the report.

### SIXTH ANNUAL DENTAL MEDICINE SEMINAR SCHEDULED FOR OCTOBER

The program for the sixth annual Dental Medicine Seminar, to be held in Palm Springs, Calif., Oct. 23-28, has been completed according to Hermann Becks, San Francisco, seminar president. A seven-man panel will make up the faculty of the seminar, which is to be devoted to improving "understanding of the fields bordering dentistry and medicine."

Speakers on the program will include

Francis A. Arnold, Jr., senior dental surgeon, U.S. Public Health Service and assistant director of the National Institute of Dental Research; Harold Copp, associate professor of physiology, University of California; Arthur C. Curtis, professor and director of the department of dermatology and syphilology, University of Michigan; Seymour M. Farber, assistant clinical professor of medicine, University of California; Wilton M. Krogman, professor of physical anthropology, University of Pennsylvania; Balint Orban, author and director of research, Colorado dental foundation and Paul Popenoe, director of the American Institute of Family Relations.

## OKLAHOMA DENTAL ASSOCIATION CONTRIBUTES TO RESEARCH FUND

The Oklahoma State Dental Association has been credited with contributing some $225,000 toward the building fund for a new Oklahoma Medical Research Foundation. Contracts for construction of the building were awarded late in June.

Other organizations which contributed included the Oklahoma State Medical Association, $500,000; the state nurses' organization, $50,000 and drug associations, $300,000. Contributions from persons in every walk of life ranged from 50 cents to several thousand dollars.

## TWENTY-ONE YEARS OF PERFECT ORAL HEALTH IS SCHOOL RECORD

An unusual achievement, that of graduating a school's entire eighth grade for the 21st year with perfect oral health, was reached recently when the St. Paul Lutheran School, Melrose Park, Ill., held its annual graduation exercises.

The class of 50 pupils was presented with a certificate from the Chicago Dental Society and a statement made by Lon W. Morrey, editor of THE JOURNAL, was read. It said in part: "To graduate its eighth grade class for 21 consecutive years with mouths and teeth in perfect health is an achievement unequalled by any other school in the United States."

## DENTAL PRACTICE HANDBOOK CORRECTS ERROR IN DOSAGE

Louis I. Grossman, professor of dentistry, University of Pennsylvania dental school and editor of the *Handbook of Dental Practice*, has stated that the dosage of atropin sulphate cited on page 173, second column, of the *Handbook* is in error. Instead of 5 mg., the dosage should read 0.5 mg. All copies purchased before May, 1949 are presumed to contain this error. Copies held in stock by the publisher, or which could be recalled, have been corrected.

## V.A. REPORTS 12,000 STUDYING DENTISTRY UNDER G.I. BILL

More than 12,000 veterans were studying dentistry on last Dec. 1 under two government measures which provide financial assistance, according to a report recently released by the Veterans Administration. The figures were uncovered through a V.A. study of the principal courses and employment objectives of the 2,535,385 veterans enrolled in schools and on the job training programs.

Ninety-two per cent of the trainees in dentistry, or 11,341, were enrolled in schools under the G.I. Bill and 904 disabled veterans were enrolled under Public Law 16 which provides vocational rehabilitation for those with service-connected disabilities. Of those under the G.I. Bill, 7,603 were in dental school, 3,735 were taking pre-dental work, and 103 were studying to be dental hygienists.

# BOOK REVIEWS

**Child Health Services and Pediatric Education, Report of the American Academy of Pediatrics.** 270 pages. Price $3.50. New York: The Commonwealth Fund, 1949.

At the conclusion of World War II, the American Academy of Pediatrics undertook a study of the services and facilities available for the medical care and health supervision of infants and children throughout the country. The findings of this statistical survey are presented in this book through 106 diagrams and figures, describing the services of private medical and dental practitioners, as well as the contributions of official and voluntary hospitals and community health agencies. The second half of this study is devoted to an analysis of present-day pediatric education, in the belief that the quality of child health services is determined largely by the pediatric background and orientation of the practitioner.

This report does not advance formal recommendations, but the findings lend themselves admirably to review in broad perspective as a basis for program planning. It is indicated with disquieting frankness that the present system of medical education is poorly adapted to train a physician for a general practice so largely concerned with care of children. Although dental care for children constitutes a notably small proportion of the total volume of dental services rendered annually in the U.S., there would have been ample warrant to extend the study to include a survey of pedodontic instruction in dental schools and facilities for post-graduate training in this area. The current importance of health supervision of well children underscores the inadequacy of the teaching of normal growth and development and the preventive aspects of child care.

The magnitude of the rural-urban differences in distribution of general practitioners is carefully defined. It is instructive to note that fully one third of the total child population lives in counties served by practitioners who are in the main older and equipped with conspicuously less pediatric training before starting practice.

Medical schools are faced with a unique opportunity and obligation to extend a high quality of medical care to rural areas. In this connection, the report points to the necessity for decentralization and regional planning in order to broaden the area of influence of medical teaching centers.

This book is recommended reading for all professional health workers. It certainly merits the close attention of students of child hygiene, which is the cornerstone of the public health structure.—*Samuel Herman.*

**Introduction to Physiological and Pathological Chemistry.** By L. Earle Arnow. Third edition. 595 pages. Index. Price $4. St. Louis: C. V. Mosby Co., 1949.

Written primarily for students in nursing, who may or may not have had previous training in chemistry, this book carefully but surely leads the reader through the multitude of facts, figures and symbols associated with a working acquaintance of inorganic and organic chemistry. In the second portion this working acquaintance is exercised vigorously by the far from superficial studies in physiological and pathological chemistry. The third part consists of laboratory exercises suitable to the subject matter. However, considering the limited preparation, it would again appear that undue emphasis may have been placed on the deep penetration into physiological chemistry.

The style of writing, clarity of thought and presentation, and continuity of subject matter play a major role in maintaining interest while stimulating a desire to know more about the subject. This reviewer has seen few books on chemistry which present the fundamentals of the science in such a clear cut, intelligible manner while pointing out the application and importance of these same fundamentals.

There appear to be few errors, the most obvious occurring in Table I, page 37. The relative mass of a neutron is not identical with that of a proton (a matter of no little importance and one with which Dr. Arnow undoubtedly is acquainted. The fact that both the masses of the neutron and proton are in error (1.0089, and 1.0076 respectively instead of 1.836 as given in the table) makes one wonder if the remaining values in the table are reliable. Again, on page 38, the implica-

tion is made that the nuclear structure of an atom contains electrons (negative charges), an assumption now regarded as unnecessary and obsolete.

Illustrations and diagrams, whether anatomical or chemical, are unusually well placed, well executed and skillfully connected with the subject matter. It is unfortunate that the same technical excellence was not maintained in the matter of pictures.

It is interesting to note that this book would also serve as an excellent source of review for students entering the biological sciences but who have for some reason allowed their chemical knowledge to become rusty.—*B. F. Gurney.*

**Diagnostic Oral Roentgenology.** By William E. Durbeck, D.D.S. 236 pages with 345 illustrations. Index. Price $7.50. New York: Dental Items of Interest Publishing Company, Incorporated, 1948.

In reading "Diagnostic Oral Roentgenology" one can experience the rare pleasure of receiving considerable practical information on this all important subject, without wading through volumes on chemistry, physics, anatomy, and advanced electronics. For this the author should be commended.

In the first chapter the author states, "in its true light, diagnostic roentgenology is seen as a useful and often invaluable adjunct to diagnosis, never as an adequate medium to the exclusion of other criteria." With this statement it certainly follows that the many basic sciences as well as other technical subjects should not be excluded from everyday use.

The following also is contained in the first chapter and might be considered as the theme for the entire book: "There is no room for slipshod thinking or unscientific guessing, as these will invalidate all of the perfection of technic and detailed effort in production of the film. Thus the obligations of diagnostic roentgenology are clearly defined: films must be of technical excellence; diagnosis must be precise."

The main objection to this work is a technical one, not against the author, but against the publisher for the smudged and many times unintelligible reproductions of photographs.

This book is one of the few that gives the reader some credit for knowing or having a working knowledge of subjects allied to the text and does not bore him with endless details about material that might be considered a specialty in themselves.—*Marvin E. Chapin.*

**Textbook of Public Health.** By W. M. Frazer and C. O. Stallybrass. Twelfth edition. 571 pages. Price $8.50. Baltimore: The Williams and Wilkins Company, 1948.

The reader who is familiar with previous editions of this standard British textbook will find only minor alterations in the purely scientific material. The discussion of administrative machinery, however, has been revised considerably on the basis of legislation enacted by Parliament during the years 1945 and 1946. This period was characterized by passage of the National Health Service Act, the Family Allowances Act, the National Industrial Act, and the National Insurance Act. The book is of particular value in its treatment of the administrative adjustments necessary for implementing this comprehensive legislation.

The authors avoid the parochialism of traditional texts which view the field merely from the functions of a public health department. It is refreshing to note the emphasis placed upon social medicine as a discipline which exceeds the bounds of administrative structure, considering the legion factors which may influence community health. That the public health is intimately linked to conditions of work, real wages and the standard of living is a proposition beyond controversy. American readers will be impressed with the details on housing, which has been described in our literature as the most important single unsolved public health problem.

The section on dentistry identifies the functions of school dental programs in terms strikingly consistent with the declared policies of the American Dental Association. Proper stress has been laid upon early diagnosis and treatment as the basis of a program of control of dental disease. However, the otherwise excellent account of dentistry as a public health service is seriously impaired by its failure to include discussion of program organization and evaluation, adult dental hygiene, and the prevalence of dental disorders.

The many virtues of this book recommend it unqualifiedly for inclusion in the library of all professional public health workers.—*Samuel Herman.*

**Zinsser's Textbook of Bacteriology.** Revised by Donald S. Martin, M.D., M.P.H., David T. Smith, M.D., et al. Ninth edition. 992 pages with 251 illustrations. Price $10.00. New York: Appleton-Century-Crofts, Incorporated.

The fact that this splendid work has gone into the ninth edition, is a tribute to its true value and better than any commendation a short review could bestow upon it. For the advanced student and investigator in bacteriology, the book is replete with information based upon research, representing the best in the field.

The first edition of this textbook of bacteriology was published in 1910. The outline and arrangement of chapters in general remain the same as in the eighth edition. The discussion of sulfonamides has been expanded and a section on antibiotics along with a chapter on pleuropneumonia-like organisms has been added. The contents consist of 77 chapters, well organized, with an excellent index. The authors have brought the current edition well up-to-date. In their revision they have succeeded in presenting a thorough, comprehensive study of the subject which reflects care and good judgment in the selection of references throughout the text. An extensive bibliography is appended to each chapter.

The aspect of oral bacteriology as related to dental practice is not specifically described or considered in this text but it should prove invaluable to the student and practitioner for every phase of medicine. It is one of the most exhaustive treatises on this subject, within the knowledge of the reviewer.—*E. A. Lieban.*

**Food Value Charts.** 12 charts. Price $1 per set. Philadelphia Child Health Society, 311 S. Juniper St., Philadelphia, 1948. Quantitative content of protein, calcium, phosphorus, iron, and vitamins A, $B_1$, $B_2$, C and D in average servings of foods are arranged in descending sequence. On the reverse side of each chart 9 foods are designated by shaded bars. The first listed is given a full length bar, but this bar does not represent any consistent unit. For example, the full length bar for vitamin A represents four times the daily allowance, while that for calcium represents somewhat less than one-third of the daily allowance. The charts would have been more useful if each bar had represented a definite percentage of the daily allowance of the food factor or if the top bar had a quantitative designation. This would have enabled comparison with the other foods for the fulfillment of the daily allowance. The back of each chart has the more practical value for either lay or professional use.—*Dorothea F. Radusch.*

**Pathology.** Edited by W. A. D. Anderson, M. D. 1,453 pages with 1,183 illustrations and 10 color plates. Index. Price $15. St. Louis: C. V. Mosby Co., 1948.

This single volume, weighing eight pounds, contains material by thirty-two authors. Little fault, if any, can be found with its coverage of the subject of pathology, except that many of the individual chapters seem cramped, as though the writer had difficulty in crowding his material into the number of pages assigned to him. The chapter by William H. Bauer is limited to 28 pages covering lips, mouth, teeth and neck. A number of excellent texts have been produced dealing with this same field but all of them have more than 350 pages. Dr. Bauer is highly commended for what he has been able to compress into limited space. In the preface, however, the editor indicates that it is his hope that this book may serve both as a textbook and yet be complete enough to be useful to the practitioner or graduate physician, and in this respect his hope seems to be in line with a current tendency.

Is this hope realized in this volume and is it to be encouraged, or should this tendency to produce larger and more comprehensive texts be discouraged? Can a single book supply both adequate treatment of the subject for students and a satisfactory reference book for practitioners and clinical graduates? This reviewer believes that the answer to both of these questions is emphatically no. Students should not be forced to lug heavy books from home to class rooms and the graduate practitioner deserves more generous treatment of the subject in which he is currently deeply interested than he can find in a sharply limited survey of only its broader aspects.

Superior illustrations with generous, helpful legends are relatively few in comparison with those that grade low and have entirely inadequate legends. Each chapter is followed by a well selected bibliography. The index is more than adequate. Chapters two and three are specially commended for reading by students, teachers and practitioners in dentistry.—*Edward H. Hatton.*

# CASES AND COMMENTS

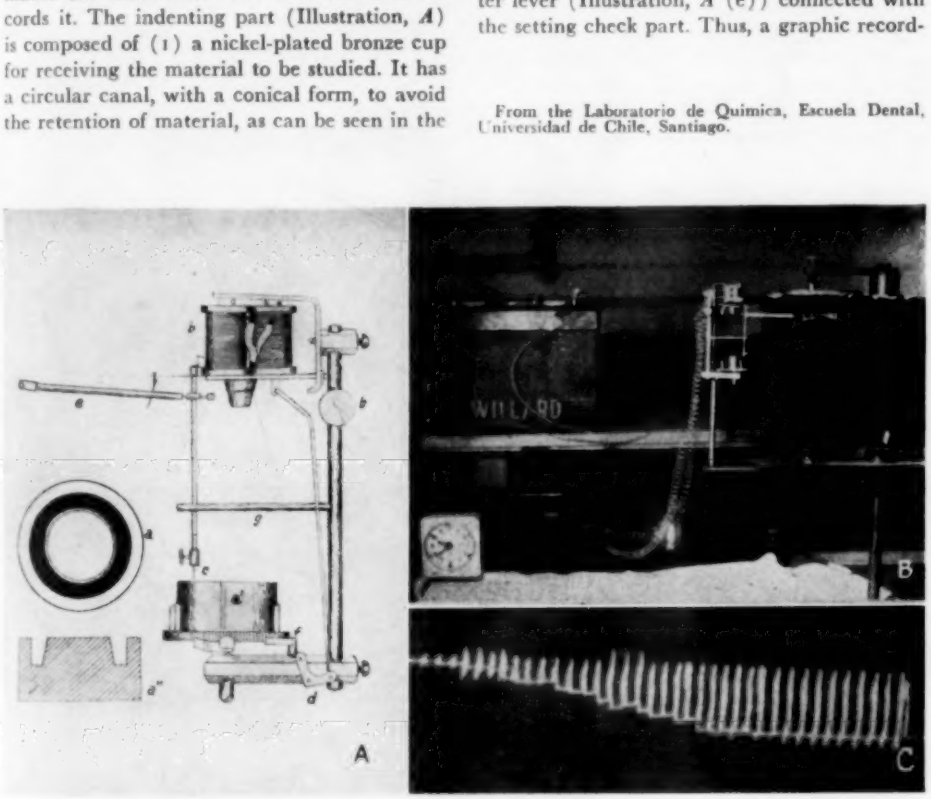
**An Apparatus for Studying the Setting Characteristics of Dental Materials.** By René Honorato C., and Horacio Rivera P., Santiago, Chile.

Sometimes it is difficult to study the progressive setting of dental materials. We did not find any graphic system for such registration in the available literature. Therefore, we devised a graphic method for studying the setting characteristics of plaster, cement, alloys and other materials.

The apparatus has two parts: one that makes the indentation and the other that records it. The indenting part (Illustration, *A*) is composed of (1) a nickel-plated bronze cup for receiving the material to be studied. It has a circular canal, with a conical form, to avoid the retention of material, as can be seen in the Illustration, *A* (a, a′, a″). (2) A simple phonograph needle (c) moved up and down by an electromagnet (b) penetrates into the checked material, less and less each time, until the setting is achieved. The setting cup is on a movable platform (f), synchronized with the ascending movement of the needle. Each time the needle goes up, the platform changes its position, therefore, the descending needle does not strike twice in the same place in the setting material.

The other part of the apparatus is formed by a kymograph (Illustration, *B*) and a register lever (Illustration, *A* (e)) connected with the setting check part. Thus, a graphic record-

From the Laboratorio de Química, Escuela Dental, Universidad de Chile, Santiago.




A: *The indenting part of the apparatus; a, setting cup, top view; a′, cup in place; a″, sectional view of setting cup; b, electromagnet; b′, knob to control ascending and descending register apparatus; c, needle; d, joint for moving platform; e, register lever; f, synchronous movable platform; g, needle guide.* B: *The complete apparatus for determining setting characteristics showing the indenting mechanism mounted on the kymograph.* C: *Kymographic setting curve*

ing of the characteristics of the setting is obtained through a kymographic record.

The cup is easily cleaned by heating it in boiling water. A thin layer of wax on the walls of the canal of the cup before using makes cleaning easier.

The kymographic tracing shown in the Illustration, *C* was obtained with artificial stone. It illustrates the simplicity and usefulness of this method in studying the hardening of dental materials and standardizes the experimental conditions.

## Avulsion of the Face: Report of a Case.

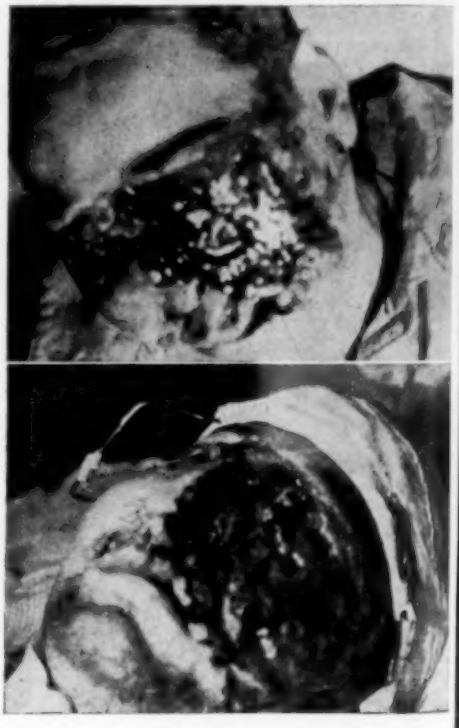
By R. O. Christensen, D.D.S., Oral Surgery Division, School of Dentistry, University of Minnesota, Minneapolis.

A 22 year old white soldier was admitted to the Plastic Center, 15th General Hospital, Liege, Belgium, January 23, 1945, as a battle casualty. He was received directly from a battalion aid station with a gunshot wound caused by a high explosive (88 mm. field gun fragment). Clinical and extraoral roentgen examination revealed the following: avulsion of face with loss of soft tissues including the skin of the entire left side of the face, with complete loss of the nose and left eye; fracture compound comminuted, complete of maxilla, horizontal, with loss of the left malar bone and partial loss of the right malar bone; loss of the anterior, lateral, medial, and partial loss of the posterior wall of the left frontal sinus with exposure of the dura, which, however, appeared to be intact. The patient had received primary dressing in a forward battle area that day and in spite of the tremendous extent of his wounds, he was in remarkably good general condition.

He was taken to the operating room shortly after arrival, and primary operation was performed. Under gas-oxygen-ether anesthesia by the endotracheal route, thorough débridement of the tissues of the face and approximation of the remaining tissues in their normal position with 00 chromic suture was carried out. The remnants of the left eye were enucleated. Six vaseline gauze drains were inserted; one in each nasal passage, one in each maxillary sinus, one in the frontal sinus and one in the left orbit. A vaseline gauze dressing was applied to the entire face with a light fluff gauze dressing and stockinet covering the entire head. A labial arch bar was applied to the maxilla for partial reduction.

On January 26th, under morphine sulfate intravenous analgesia, a plaster headcap was applied with wire extension arms; extraoral fixation provided for the fracture of the maxilla by means of a no. 26 stainless steel wire, extending from the labial arch bar through the cheeks to the extension arms of the headcap. A secondary débridement was done and fresh dressings were applied to the face. The six individual vaseline gauze dressings were changed. Three days later all dressings and drains were removed, and fresh dressings were applied.

On February 3, the patient was evacuated by air to a plastic center in the United Kingdom. His general condition was good. All wounds were clean and no gross infection was noted.



*Top: Preoperative appearance of patient. Bottom: Postoperative appearance following reduction of maxilla with extraoral fixation, and repositioning of tissues*

## Multiple Impactions: Report of a Case.

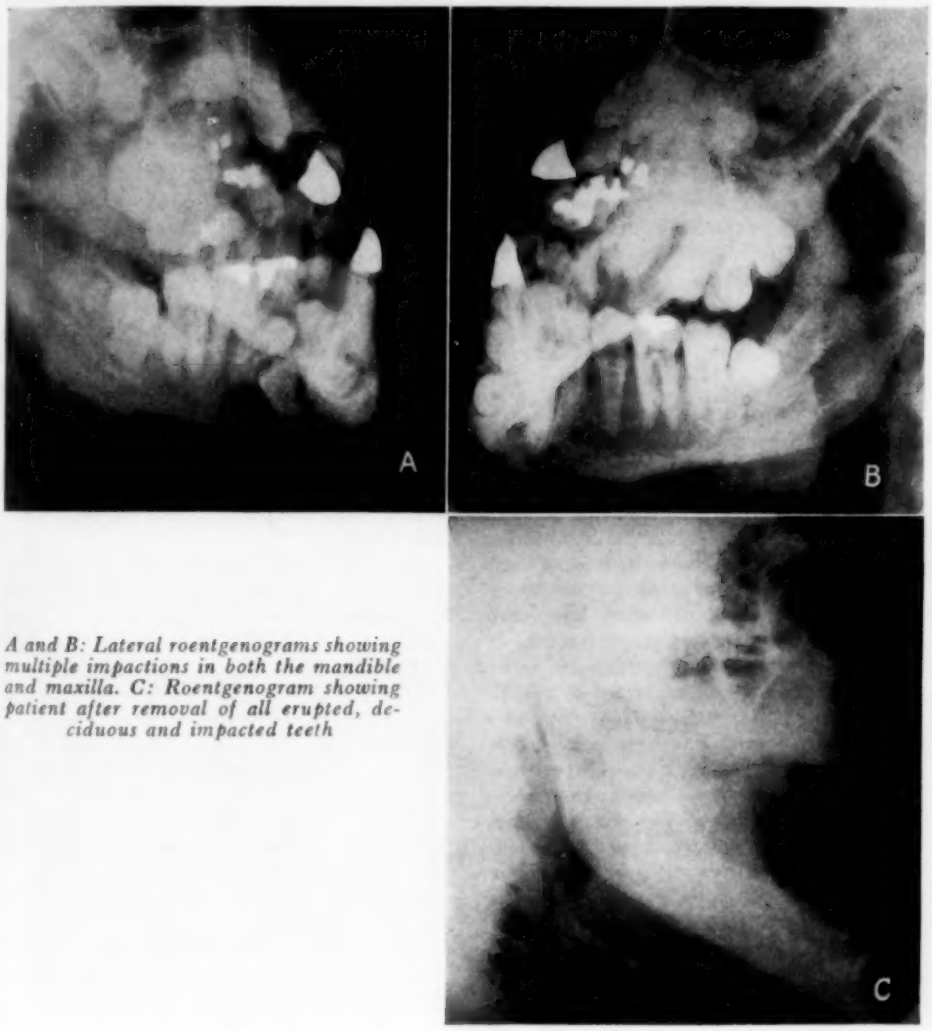
By William Rich,* D.D.S., and Thola Noon,† D.D.S., Ft. Richardson, Alaska.

A Negro soldier was admitted to the Dental Clinic, 183rd General Hospital, on August 10, 1948, as the result of a survey. An oral examination showed the presence of both deciduous and permanent teeth. All were carious and pyorrheic. Lateral roentgenograms revealed multiple impactions in both the mandible and the maxilla (Illustration, *A* and *B*). Oral hygiene was poor. There were pocket formations around all the teeth. The gingival crest gave forth purulent material on pressure.

All erupted and deciduous teeth were removed. The impacted teeth were removed in four weekly sittings (Illustration, *C*). Crystalline sodium penicillin G suspended in peanut oil and beeswax was administered daily in 300,000 units during the entire period of treatment. Recovery was uneventful. Healing was complete within six months, at which time full dentures were inserted.

* Lieutenant colonel, U. S. Army, Dental Corps, now stationed with the 183rd General Hospital, Ft. Richardson, Alaska.

† Major, U. S. Army, Dental Corps, 6006 A.S.U., Post Surgeon's Office, Fort Lewis, Wash.




*A and B: Lateral roentgenograms showing multiple impactions in both the mandible and maxilla. C: Roentgenogram showing patient after removal of all erupted, deciduous and impacted teeth*

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He was taken to the operating room shortly after arrival, and primary operation was performed. Under gas-oxygen-ether anesthesia by the endotracheal route, thorough débridement of the tissues of the face and approximation of the remaining tissues in their normal position with 00 chromic suture was carried out. The remnants of the left eye were enucleated. Six vaseline gauze drains were inserted; one in each nasal passage, one in each maxillary sinus, one in the frontal sinus and one in the left orbit. A vaseline gauze dressing was applied to the entire face with a light fluff gauze dressing and stockinet covering the entire head. A labial arch bar was applied to the maxilla for partial reduction.

On January 26th, under morphine sulfate intravenous analgesia, a plaster headcap was applied with wire extension arms; extraoral fixation provided for the fracture of the maxilla by means of a no. 26 stainless steel wire, extending from the labial arch bar through the cheeks to the extension arms of the headcap. A secondary débridement was done and fresh dressings were applied to the face. The six individual vaseline gauze dressings were changed. Three days later all dressings and drains were removed, and fresh dressings were applied.

On February 3, the patient was evacuated by air to a plastic center in the United Kingdom. His general condition was good. All wounds were clean and no gross infection was noted.

*Top: Preoperative appearance of patient. Bottom: Postoperative appearance following reduction of maxilla with extraoral fixation, and repositioning of tissues*

## Multiple Impactions: Report of a Case.

By William Rich,* D.D.S., and Thola Noon,† D.D.S., Ft. Richardson, Alaska.

A Negro soldier was admitted to the Dental Clinic, 183rd General Hospital, on August 10, 1948, as the result of a survey. An oral examination showed the presence of both deciduous and permanent teeth. All were carious and pyorrheic. Lateral roentgenograms revealed multiple impactions in both the mandible and the maxilla (Illustration, *A* and *B*). Oral hygiene was poor. There were pocket formations around all the teeth. The gingival crest gave forth purulent material on pressure.

All erupted and deciduous teeth were removed. The impacted teeth were removed in four weekly sittings (Illustration, *C*). Crystalline sodium penicillin G suspended in peanut oil and beeswax was administered daily in 300,000 units during the entire period of treatment. Recovery was uneventful. Healing was complete within six months, at which time full dentures were inserted.

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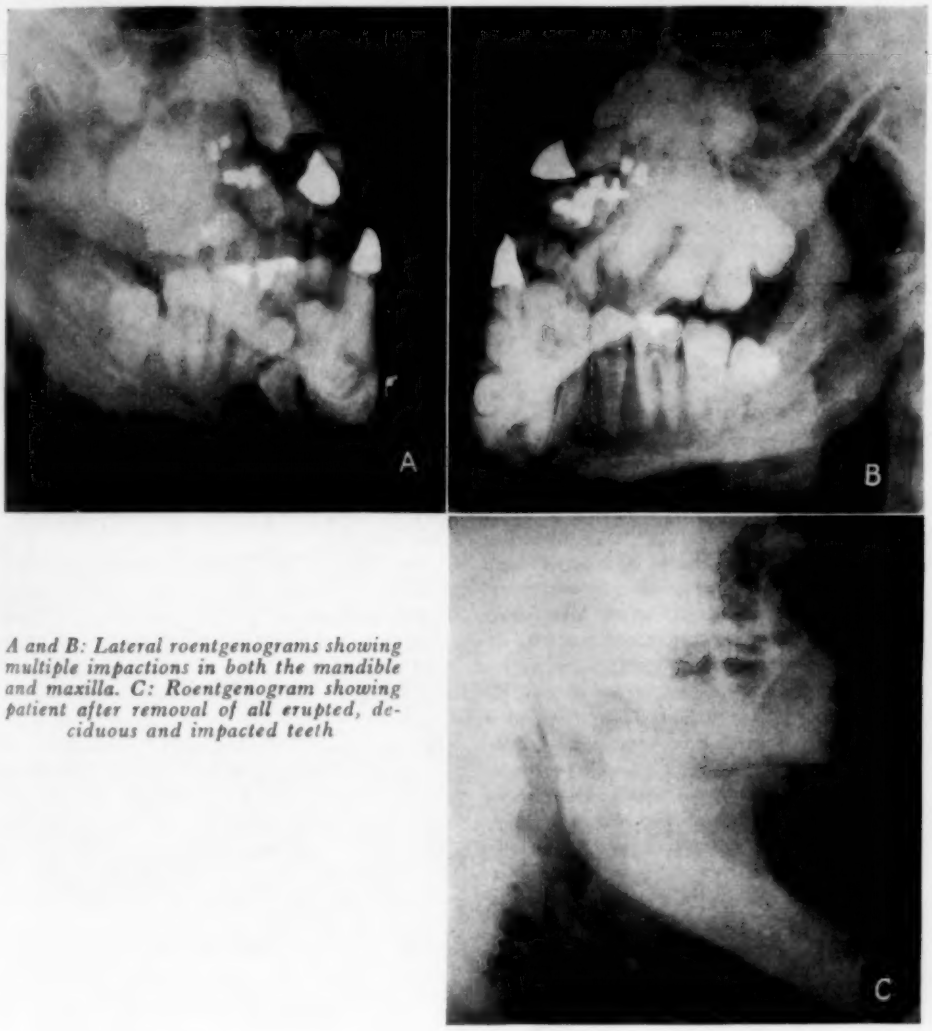


*A and B: Lateral roentgenograms showing multiple impactions in both the mandible and maxilla. C: Roentgenogram showing patient after removal of all erupted, deciduous and impacted teeth*

**Report of An Oral Examination on One Thousand School Children in the Dominican Republic.** By F. Garcia Godoy, Clinica Dental Paiewonsky, Ciudad Trujillo.

This study was carried out late in 1948 and early 1949 among 1,000 children from five schools in this city. Both sexes and several races are represented. Examination was done with dental mirror and explorer.

Results of the examination follow:

1. Dental caries was present in 95.4 per cent of all those examined.

2. Male children showed a higher average of carious lesions than did the females.

3. Among the 500 male children examined, 1,462 first permanent molars were either affected by caries, filled, extracted or needed some oral intervention.

4. There were 1,691 carious maxillary teeth and 1,528 carious mandibular teeth in the male group.

5. Among 500 female children examined there were 1,430 first permanent molars either affected by caries, filled, extracted or in need of dental intervention.

6. In the female group there were 1,591 carious maxillary teeth and 1,332 carious mandibular teeth.

**Surgical Removal of a Fibroma and Lipoma from the Maxilla: Report of a Case.** By R. O. Christensen, D.D.S., Oral Surgery Division, School of Dentistry, University of Minnesota, Minneapolis.

A thin, undernourished white woman, aged 45, who appeared much older, was referred by her dentist on July 7, 1947, for the removal of a large pedunculated growth attached to the maxilla, preventing use of her upper denture. The patient stated that in the summer of 1926, at Minneapolis General Hospital, a large growth had been excised from the upper right cuspid region. The teeth on both sides of the growth also were removed at that time. In 1930 all the remaining maxillary teeth were extracted, and since that time she has been wearing a full upper denture. About a year after construction of the denture, she noted a slight growth underneath it. The growth continued to increase in size until its present intolerable state was reached.

*Gross appearance of fibroma preoperatively. Inset: Fibroma and lipoma after surgical removal*

Clinical examination revealed a large pedunculated bifid growth, highly inflamed, under an overlapping and ill-fitting upper denture. Intraoral roentgen examination was essentially negative except for a somewhat resorbed appearance of the bone beneath the area of the growth. Results of a cursory physical examination were essentially negative. A tentative diagnosis of denture scar and fibroma of the upper right maxilla was made. The denture was taken from the patient and she was instructed to rinse her mouth with saline mouth washes three times a day until the inflammation subsided.

On July 15 the patient returned with the inflammation somewhat reduced, and the gross appearance of the growth had changed from bifid to round and firm. A diagnosis of fibroma was made.

Wide excision of the growth was carried out under local infiltration anesthesia with 1½ per cent "Monocaine," "Adrenalin" 1:100,000. Dissection revealed what appeared to be a fibrous capsule beneath the growth itself and further exploration and dissection along this plane disclosed a large, well rounded mass of firm tissue. This was removed, and upon sectioning, it appeared to be composed entirely of lipoid tissue. Tentative diagnosis of lipoma was made of this tissue. After wide undermining, the wound was closed primarily with 00 interrupted silk

sutures. Healing was by primary intention, and no complications occurred. The pathologic report was (1) fibroma, (2) lipoma.

This case is interesting because of the existence of a lipoma with a coexistent fibroma attached to its outer surface. I have been unable to find any information in the literature as to the etiologic relationships of these two tumors existing together. Another point of interest is how a person could tolerate the existence of such a large growth for the period of years this patient did. It is amazing to see among a wide variety of patients the varying degrees of tolerance to unnatural growths of the mouth.

## Anodontia in a Child: Report of a Case.

By Harry E. Loving, D.D.S., Bristol, Tenn.

This female patient was first seen at the age of three and a half years when her parents became concerned about the non-eruption of her teeth. Roentgenographic examination both intra and extra oral, showed no sign of teeth or buds at this age.

The child was not seen again until she had reached the age of seven and a half, whereupon clinical examination showed upper right and left peg shaped maxillary cuspids had erupted. Again, however, roentgenographic examination failed to show the presence of other teeth. The child was timid and had somewhat the appearance of a 45 year old woman. She is one of six children, two of whom are younger than she, and has had the usual childhood diseases including pneumonia. She weighed five pounds at birth.

Treatment included the construction of small trays for both arches; compound snap impressions and the adaptation of base plate trays. Impressions were taken, models poured and bite blocks made so central occlusion could be registered. Acrylic teeth of the lightest shade were used and the two cuspids were adapted with orthodontic wire.

The child has been wearing the dentures regularly without objection and her appearance has been restored to that of a normal child. She presently is attending school and appears to be happy. Only one adjustment on the dentures has been necessary.

*The child before and after insertion of the dentures*

## Extraoral Salivation: Report of a Case.

By Lawrence Heiman, D.D.S., New York.

A white, male war veteran, 24 years old, complained that since his injury suffered on January 14, 1945, near Bastogne, Belgium, when a shell fragement pierced the left side of his face just below the zygoma and exited at about the same general region of the right side of the face, he has had difficulty masticating dry foods and that during mastication saliva runs down his right cheek. It is established that the shell fragment evulsed all the maxillary molar teeth as well as portions of the maxilla and palate, and that continuity of the palate has been restored by a plastic operation. The veteran now is undergoing treatment for restoration of the lost maxillary molars by means of a partial denture.

He now is unable to soften dry foods without excessive mastication and mixing of the bolus. In addition, it has been shown that after four minutes of mastication the temporomandibular joint becomes moist and in eight minutes, the moisture begins to form rivulets on the cheek. Close scrutiny of the area at which the saliva was forming did not reveal any apparent fistulae. The saliva comes from a diffuse area about an inch in diameter; apparently through the pores of the skin.

Further examination verified the conclusion that the cause of the extraoral salivation obviously was a destroyed or constricted Stenson's duct on the right side which stopped the flow of saliva from the parotid gland to the mouth. The duct was almost obliterated by the shell fragment and all that could be seen of the destroyed canal was the tissue flap guarding the opening. Surgical intervention is indicated to restore normal salivary output.—*252 Seventh Avenue.*

# REPORTS OF COUNCILS

## COUNCIL ON DENTAL HEALTH

### CHILDREN'S DENTAL HEALTH DAY: REPORT ON FIRST NATIONAL OBSERVANCE

THE first annual Children's Dental Health Day was held February 7, 1949. A similar event will be held each year under the auspices of local, state and national dental societies. The House of Delegates of the American Dental Association adopted the project on the recommendation of the Cleveland Dental Society, and directed the Council on Dental Health to organize the nationwide program. Originally it was hoped to have the President of the United States issue a proclamation which, unfortunately, was not forthcoming. An attempt is now being made to secure a proclamation through congressional action.

The purpose of this event is to direct the attention of the public and the dental profession to the need for making available more and better dental health education and care for children and youth. In addition, this new nationwide activity is intended to promote dentistry for children and to aid in establishing and maintaining school and community dental health programs for children.

After consulting with a number of individuals and groups especially interested in annual health days and community health programs and with officials of state and local dental societies, the Council on Dental Health selected the first Monday in February as the annual Children's Dental Health Day.

The annual observance of Children's Dental Health Day should not be considered a complete dental health program for children. Obviously, a complete program can be the result only of a year-round effort. The one day observance, however, serves to focus interest on this important phase of school and community health.

For maximum effectiveness, the Council on Dental Health recommended that Children's Dental Health Day programs be organized on a community basis in cities and towns and on a county basis in rural areas, and that the day's activities be initiated by the dentists through the local dental society. Participation by state dental societies was stressed. Various methods of assisting component groups were suggested, such as encouraging local dental societies and dentists in smaller communities to plan a Children's Dental Health Day program, publishing announcements, editorials and other publicity material in the journal of the state society and assisting local dental societies in securing speakers.

This first national observance of Children's Dental Health Day was handicapped from the beginning on both the national and state levels by the lack of time for preparation and budgeted funds. However, the enthusiasm with which the constituent and component societies entered into the project is indicative of a widespread awareness of dentistry's responsibilities in the field of public health. The fact that one community extended

its celebration to two days (Sixth District, Pennsylvania) and another to a week (San Francisco) shows a growing demand for dental health services for children. Throughout the reading of the reports from the various communities, the cooperation shown by other groups is notable and encouraging. These groups included not only those organized for the promotion of health but also many groups active in unrelated fields.

## Varied Activities

The Council on Dental Health has received information from 95 communities in 27 states, the Territory of Hawaii and the District of Columbia as to how the first National Children's Dental Health Day was observed. Communities in these states reported: Alabama, Arkansas, California, Colorado, Connecticut, Florida, Illinois, Iowa, Kansas, Louisiana, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New Jersey, New York, Ohio, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, West Virginia and Wisconsin. Undoubtedly there are other areas which observed the day but concerning which information is not at present available in the Central Office.

A variety of means were employed to focus attention on the benefits to be derived by society from an improvement in the dental health of children. The accompanying table shows the number of communities using the most popular methods of disseminating information.

The originality shown in many communities in bringing to the attention of the public Children's Dental Health Day is of particular interest and is an inspiration in planning for an even more extensive celebration of this day in 1950. Owing to the limitations of space and the fact that similar methods of observance were used in many areas, the activities in each state will not be described in detail. However, some of the high lights as they have come to the attention of the Central Office will be emphasized.

Cleveland, the city which nine years ago first celebrated an annual Children's Dental Health Day, again presented an elaborate program for both the profession and the laity. Among the features of the layman's program were a talk by Dr. H. B. Millhoff, chief of the Ohio State Department of Health, motion pictures and animated cartoons for children. The title of Dr. Millhoff's address was "How Effective Is Sodium Fluoride in Decay Prevention?" The scientific meeting included table and limited attendance clinics and motion pictures. At the dinner Dr. H. A. Zander, professor of pedodontics at Tufts Dental School, Boston, spoke on "The Relationship of the Primary and Permanent Pulp to Restorative Dentistry."

The Detroit District Dental Society, another pioneer in the celebration of a Children's Dental Health Day, reported that the scientific meeting for dentists drew an attendance of approximately 300. This observance of Children's Dental Health Day was the second in Michigan. Two other district dental societies (Jackson and Saginaw Valley) reported activities in promoting dental health education.

With reference to the demonstrations reported by 17 communities, three cities in Connecticut (Hartford, Norwich and

| Activity | Number of communities |
|---|---|
| Proclamation by governor | 13 |
| Proclamation by mayor | 33 |
| Scientific meetings | 38 |
| Lay meetings | 34 |
| Newspaper releases | 76 |
| Radio programs | 70 |
| Poster contests | 20 |
| Essay contests | 4 |
| School programs | 38 |
| Exhibits | 24 |
| Demonstrations | 17 |

Wallingford), Sixth District Dental Society of Pennsylvania and the Detroit District Dental Society listed these as sodium fluoride demonstrations.

The District of Columbia Dental Society, as well as the Ninth District Dental Society of Tennessee, Cleveland and Buffalo, reported the use of television. It would be interesting to know whether any other communities used this rapidly growing means of education and entertainment. The District of Columbia Dental Society also was instrumental in obtaining the cooperation of the National Dairy Products Corporation in its coast-to-coast broadcast originating in New York.

In California, with the cooperation of the California Dairy Advisory Board, 250,000 cards carrying a dental health message were distributed. In addition, street car advertising and window displays were employed, and dental educational pamphlets and Mickey Mouse certificates for clean teeth were presented to school children. The *Journal of the California State Dental Association* devoted its January-February issue to dentistry for children. An event which added considerably to the interest in Children's Dental Health Day was the completion by 79 San Francisco school teachers of the first university accredited course entitled "Seminar in Health." This course is given jointly by the San Francisco District Dental Society and the San Francisco County Medical Society.

An outstanding example of cooperation in the observance of Children's Dental Health Day is found in Kansas, where more than 1,000 dentists, 2,000 school officials, 600 P.T.A. units, 105 county welfare departments, 400 workers in public health, 900 druggists, 19 radio stations, dozens of newspapers and journals and bulletins of cooperating groups pooled their activities on state and local levels in a campaign designed to improve dental health education and dental care. One immediate result of the celebration was the inclusion of nine additional counties in the state dental health program, bringing the total to 92 of the 105 counties in the state. Included in the material distributed were approximately 60,000 pieces of literature and motion pictures, 6,000 letters to officials and units of cooperating groups and 8,000 school dental health forms.

Another example of cooperation with other groups was noted in Massachusetts, where the Massachusetts Dental Society coordinated its celebration of Children's Dental Health Day with activities in connection with the first Massachusetts Health Conference and the campaign of the American Heart Association.

The Minnesota State Dental Association, which sent letters to its entire membership, school superintendents, county and city representatives and newspaper editors, reported interest and help in the observance of Children's Dental Health Day from all sources in the state.

The Mississippi Dental Association, with the cooperation of the State Board of Health, likewise used letters to dentists, health officers, radio stations and newspapers as a means of stimulating interest in dental health education. Dental examinations were conducted in junior and senior high schools, and talks were given to school and civic groups. Lamar School in Laurel reported that a group of 46 beginners had entered school with all dental corrections completed.

In Nebraska, the Lincoln District Dental Society presented a panel discussion on the care of children's teeth. This discussion, led by four dentists, was open to the public. A talk entitled "The Child Patient in a General Practice" was presented by Dr. Alfred E. Seyler, Detroit, president of the American Society of Dentistry for Children.

In addition to the usual ways of observing Children's Dental Health Day, Essex County, New Jersey, reported that 20 service clubs with 30 members each

were supplied with speakers. In Monmouth County, most of the 30 school dentists either initiated or conducted school dental health programs. In Passaic County, exhibits were set up in the largest cities, and free bitewing roentgen examinations of children's teeth were made. Other areas which made free bitewing roentgen examinations were Charleston, West Virginia, where 2,000 students were examined, and the Sixth District Dental Society of Pennsylvania.

Nine communities in New York reported regarding the observance of Children's Dental Health Day, with the cooperation of the Bureau of Dentistry, State Board of Health. The American Legion assisted in the poster contest. In Brooklyn, Kings County, 80 talks were given by 60 dentists. National radio broadcasts and window displays were featured. A puppet show was televised.

The Oregon State Dental Association distributed to schools a pamphlet urging a six point child health program. Copies of an outline of a speech suitable for delivery to junior high school children were made available to dentists. Letters to school principals called attention to Children's Dental Health Day. A series of statewide radio programs was presented. Portland dentists gave talks before clubs on the subject, "Dental Decay Can Be Controlled." All art classes in Portland cooperated by having students submit designs for next year's dental health button.

In Pennsylvania, Children's Dental Health Day was celebrated by the Third, Fourth, Fifth, Sixth and Ninth District Dental Societies, Reading Dental Society, Philadelphia County Dental Society and Odontological Society of Western Pennsylvania. In the Fourth District, hygienists assisted by giving talks in the schools. The Sixth District Dental Society reported that, besides the previously mentioned sodium fluoride demonstrations, some of the oldest dental practitioners were interviewed and photographed. Other unusual means of publicity and education included dissemination of information by milk companies and bakeries, trailers in community theaters, dental office displays in store windows, free toothbrushes and free bitewing roentgen examinations. The Odontological Society of Western Pennsylvania distributed toothbrushing charts and catalogs of A.D.A. dental health education material to 413 schools.

The organization of Children's Dental Health Day programs in the future will require careful appraisal of the results obtained from year to year. Considerable emphasis, therefore, must be given to the development of reporting and evaluating procedures.

COUNCIL ON DENTAL THERAPEUTICS

# DRUG THERAPY IN ENDODONTIA: QUESTIONS AND ANSWERS

F. D. Ostrander, D.D.S., M.S., Ann Arbor, Mich.

This article is one in a series of question and answer papers which are prepared by qualified experts at the request of the Council on Dental Therapeutics. The opinions expressed are those of the author and do not necessarily reflect the opinions of the Council.

**Q.** For what purposes are drugs or chemicals used in endodontia?

A. With the possible exception of oral surgery, drugs will be employed more frequently in endodontia than in any other phase of dental practice. The following are purposes for which the endodontist will use drugs or chemicals: (1) Preoperative sedation. (2) Control of pain during pulpectomy or root resections. (3) Occasionally for enlargement or dehydration of the pulp canal. (4) Irrigation and washing of the pulp canal to remove organic material and debris. (5) Disinfection of the pulp canal and periapical areas. (6) Systemically, on occasion, for the control of severe fulminating periapical infections. (7) Control of pain following endodontic procedures.

**Q.** Under what conditions should the endodontia patient receive preoperative medication?

A. Patients who are known to be extremely apprehensive and nervous or who have a history of untoward reactions to local anesthetics should generally be given sedatives prior to the more extensive procedures such as pulpectomy, root resection or periapical curretage.

**Q.** What drugs should be used preoperatively?

A. The drugs best suited for this purpose are the barbiturates. Judicious use of one of this group of drugs will make the patient much less apprehensive and eliminate many of the minor but annoying nervous reactions frequently exhibited by such patients. It has been clearly demonstrated that barbiturates oppose the toxic effects of local anesthetics and generally reactions to them will be minimized or eliminated by proper premedication. The choice of the barbiturate and the dosage will depend upon the individual patient and conditions. In general a rapidly acting barbiturate of brief duration which causes few side reactions is to be desired. Members of the barbiturate group generally suitable include pentobarbital sodium, 0.1 to 0.2 Gm. (1½ to 3 grains); hexobarbital A.D.R., 0.13 to 0.26 Gm. (2 to 4 grains) "Seconal"* sodium N.N.R., 0.1 to 0.2 Gm. (1½ to 3 grains). Occasionally when the contemplated operation is to be extensive, it may be desirable to use one of the longer acting barbiturates.

Associate professor of dentistry (materia medica and therapeutics), University of Michigan.

*Seconal is a trademark for 5-allyl-5-(1-methyl-butyl) barbituric acid.

Q. What postoperative precautions should be observed when the patient has been given a barbiturate?

A. In all cases when a barbiturate is used the dentist must make sure that the patient does not attempt to drive or even walk home until he has recovered from the depressant action of the drug. Usually patients who are to be premedicated should be accompanied by a member of the family or a friend.

Q. What local anesthetic solutions are suitable for use in endodontia?

A. Any of the numerous anesthetic preparations which are listed in Accepted Dental Remedies are suitable for use in endodontia. In certain instances such as the extirpation of painful hyperemic pulps which are difficult to anesthetize, the use of the 4 per cent procaine solutions which are listed in A.D.R. may be desirable. However 2 per cent procaine or 1 or 1½ per cent butethamine ("Monocaine") hydrochloride solutions will be entirely adequate for routine use. In general, poor local anesthesia is a reflection of poor injection technic rather than poor solutions. Every dentist who practices endodontia should be skilled in the use of local anesthetics.

Q. When is chemical enlargement of the root canals indicated?

A. Since chemical agents which will decalcify the dentin and thus aid in enlargement of the root canals are all caustics, they should be used only when the canal offers unusual difficulties to mechanical enlargement or when a root resection or periapical curettage is to be done. In the latter case the periapical tissues are to be removed and slight cauterization caused by the chemical diffusing through the apex will not be of great significance. The use of decalcifying agents in the presence of normal periapical tissues is contraindicated unless unusual obstructions make mechanical enlargement of the canals impossible.

Q. What agents are best suited for this purpose?

A. Phenolsulfonic acid, sulfuric acid and hydrochloric acid are most frequently used. Concentrated sulfuric acid should not be employed because of its extremely corrosive action. It is usually used in concentrations of 30 to 50 per cent and hydrochloric acid is most commonly used in 30 per cent strength. At the University of Michigan, School of Dentistry, phenolsulfonic acid made according to the following formula is preferred:

Concentrated sulfuric acid . . . 97 cc.
Phenol crystals . . . . . 90 Gm.
Hold at 100 degrees C. for 20 hours.

The above preparation is not as caustic or destructive as sulfuric acid and has a syrupy consistency which makes it relatively easy to handle. In addition it is a strong dehydrating agent which is advantageous in chronically infected cases where the dentinal tubules may be saturated with the irritating products of protein degradation.

After any acid is used for root canal procedures it must be neutralized and this is most commonly done with a suspension or solution of sodium bicarbonate.

Q. Why is irrigation and washing necessary in order to obtain optimum results in root canal therapy?

A. Since all antiseptics are less effective in the presence of organic matter it is highly essential that all pulp debris, pus and exudates be eliminated as far as possible from the pulp canals if optimum results are to be obtained from drugs or chemicals. Any remaining organic material, in addition to inhibiting the bactericidal action of drugs, may harbor large quantities of bacteria and provide a medium upon which they may live and multiply.

Q. What drugs are suitable for irrigating and washing root canals?

A. Probably the most effective drug for this purpose is sodium hypochlorite solution U.S.P. or one of its modifications such as Labarraque's solution or "Hyclorite" A.D.R. Grossman and Meiman[1] have demonstrated the effectiveness of this preparation as a solvent for necrotic pulp tissue. It has the advantages of being mildly antiseptic and of being noninjurious to the periapical tissues. Grossman[2] prefers to irrigate the canals alternately with this type of preparation and hydrogen peroxide solution U.S.P., about 0.5 cc. of one solution being immediately followed by the same amount of the other until no further debris is obtained from the canal.

Q. What precautions should be observed in irrigating root canals?

A. The method used must avoid forcing bacteria or irritating substances through the apex of the root into the periapical area. If the solution is introduced with a syringe the needle should be placed loosely in the canal to prevent development of pressure. If a root canal file is used it must be done with a rotary rather than a pumping motion.

Q. Why is it necessary to treat infected root canals?

A. Endodontia must be based on scientific principles. Before any root canal is filled all bacteria must be eliminated from the root canal and the periapical area and sterility must be demonstrated by means of bacteriologic cultures. The technic for culturing root canals is not unduly time-consuming and may actually save time in many instances since those canals which are not infected or are easily sterilized can be filled without prolonged treatment.[3]

Q. How can the effectiveness of treatment be determined accurately?

A. There is no method other than cultures which will determine when infection has been eliminated from the periapical area. This has been demonstrated well by Grossman who cultured 150 teeth which had been treated by various dentists and determined by them to be ready for filling by clinical means. Of these 150 teeth, 63 or 42 per cent were found still to be infected when bacteriological cultures were taken.[4]

Q. What should be the characteristics of a root canal and periapical antiseptic?

A. 1) It must be effective in the presence of organic matter.

2) It must be effective against all types of organisms found in root canal and periapical infections.

3) It must be noninjurious to periapical tissues.

4) It should remain active for at least 48 hours after it is sealed in the root canal.

5) It must not stain tooth structure.

Q. Which commonly used drugs best meet the above requirements?

A. No presently known drug meets the above requirements perfectly, but the following are among the better ones for general use:

1) Camphorated p-chlorophenol. Camphorated p-chlorophenol is prepared by triturating 21 Gm. of camphor with 9 Gm. of p-chlorophenol. Several investigators have reported favorably upon this antiseptic.[3, 5, 6] It is not injurious to the

1. Grossman, L. I. and Meiman, B. W., Solution of Pulp Tissue by Chemical Agents. *J.A.D.A.* 28:223 (Feb.) 1941.

2. Grossman, L. I., *Root Canal Therapy*, ed. 2. Chapt. XIII. Lea and Febiger, Philadelphia 1946.

3. Ostrander, F. D. and Crowley, Mary C., The Effectiveness of Clinical Treatment of Pulp Involved Teeth as Determined by Bacteriological Methods. *Jour. of Endodontia* 3:6 (Jan.) 1948.

4. Grossman, L. I., Probable Percentage of Correct Guesses Regarding Sterility of Root Canals Without Bacteriological Control. (Abstr.) *Jour. Dent. Res.* 15:364 (Sept.) 1936.

5. Pear, J. R., Bactericidal Effects of Some Drugs Used in Pulp Canal Therapy. *J.A.D.A.* 29:244 (Feb.) 1942.

6. Grossman, L. I. and Prinz, H. A., Comparative Study of Root Canal Therapy With 1) Camphorated Chlorophenol and With 2) Electrosterilization. *Dent. Cosmos* 74:324 (April) 1932.

periapical tissues and is highly effective clinically.

2) Chloroazodin U.S.P. ("Azochloramid") in a 1 per cent solution in triacetin is effective but may discolor anterior teeth and sometimes produces a copious exudate in the root canals even after they become sterile. However, its effectiveness and bland character justify its inclusion in the armamentarium of the endodontist.

3) Beechwood creosote is effective[7] and relatively non-irritating but it has such a strong odor and taste that its use is decreasing. However, it deserves a place as an alternate drug when others are not effective.

*This list of drugs is not intended to be complete. Many may make rational use of other drugs. Such caustic and irritating preparations as formaldehyde-cresol mixtures and iodized phenol are purposely omitted from the list. Their routine use is contraindicated because of their injurious effect on periapical tissues.*

Q. What is the status of the sulfonamides for topical use in treatment of root canal and periapical infections?

A. Although some reports of effective use of the sulfonamides have been published[8, 9, 10] the author[11] has previously stated that in his experience the sulfonamides are inferior to commonly used antiseptics. After a thorough study of the application of concentrated solutions of sulfonamides in root canals, Grossman[12] concluded that there was no advantage in their use for this purpose. There is no reason to believe that the sulfonamides should be used extensively in topical root canal therapy.

Q. What is the present status of the antibiotics for topical treatment of root canal and periapical infections?

A. Such use of the antibiotics has not yet been adequately evaluated but there is reason to believe that certain members of this group may have some value, either alone or in combinations. Reports on penicillin have been conflicting, which may be due in part to the fact that many strains of organisms isolated from root canals are penicillin-resistant as demonstrated by Crowley and Harner.[13] Best results have generally been reported with high concentrations of penicillin.[14, 15] A combination of penicillin and streptomycin may be more effective than penicillin alone.[16] Using strong suspensions of penicillin the author and his associates did not obtain results equivalent to those obtained with more commonly used drugs,[17] but in a study now being conducted in which a strong suspension of penicillin and streptomycin is being used, preliminary results have been much better.

The following tentative conclusions are justified: (1) Penicillin-resistant organisms are frequently encountered in root canals, making the routine use of penicillin alone inadvisable. In any case which does not respond readily to penicillin other drugs should be substituted. (2) To be most effective in root canal therapy the antibiotics must be used in

7. Kitchin, P. C. and Horton, B. T., The Relative Efficiency from a Bacteriologic Standpoint of Some Materials Used in the Treatment of Putrescent Root Canals. *J.A.D.A.* 18:1668 (Sept.) 1931.

8. Adams, F. R., Sulfanilamide and Heat in Root Canal Therapy. *Dent. Items Int.* 62:315 (April) 1940.

9. Idem, Penicillin in Pulp Canal Therapy. *Dent. Items Int.* 66:1147 (Dec.) 1944.

10. Rosen, Norman, Root Canal Therapy and the Use of Sulfonamides. *J.A.D.A.* 31:622 (May 1) 1944.

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high concentration. (3) Because of the frequent presence of resistant organisms it is probable that combinations of antibiotics will be desirable to increase the range of effectiveness. (4) Penicillin and streptomycin are only two of many antibiotics. Other members of this group or combinations of members may be found superior to either penicillin or streptomycin.

**Q.** Is a special culture medium required when penicillin or other antibiotics are used in the treatment of root canal or periapical infections?

A. Yes! When penicillin is used in root canal treatments a culture medium should be used which will neutralize any penicillin which is carried into it from the tooth. The most commonly used agent for this purpose is penicillinase which is added to the medium in concentration of approximately 0.66 Schenley unit per cc. Some manufacturers produce media in sterile tubes which meet the requirements for neutralizing both penicillin and streptomycin. If other antibiotics or sulfonamides are used, suitable media to neutralize them must be used or false negative cultures may be obtained.

**Q.** Should the same drug be used repeatedly in the treatment of infected root canals and periapical areas, and how frequently should dressings be changed?

A. If a root canal or periapical infection does not respond readily to one drug another should be substituted. Some strains of organisms may have, or may acquire, a resistance to a given drug. For this reason many prefer to rotate their drugs from treatment to treatment. The optimum frequency for changing dressings is generally 48 hours. This allows time for incubation of cultures but is not so long as to result in serious inactivation or dilution of the drug. In certain acute infections it may be necessary to change dressings more frequently and in routine cases a slightly longer period than 48 hours will usually do no harm when more frequent changes are not possible.

**Q.** When is systemic chemotherapy indicated in endodontia?

A. In the treatment of ordinary chronic or subacute infections encountered in endodontia topical medication will be effective and free from the risks always associated with the systemic use of the sulfonamides and, to a lesser extent, the antibiotics. However, the endodontist will occasionally encounter a periapical infection which is spreading rapidly and cannot be controlled by topical medication. In these instances systemic use of the sulfonamides or penicillin or both is indicated. If the dentist is thoroughly trained in the use of these drugs he may administer them himself but in many instances it will be desirable to seek the aid of an oral surgeon or physician.

**Q.** What are the values and limitations of electro-medication in the treatment of root canal and periapical infections?

A. While there is some evidence that negative cultures can be obtained somewhat more rapidly when electro-medication is used, the individual treatments are time-consuming and therefore not adapted for routine use. Its field of usefulness seems to be largely in those more difficult cases which do not respond readily to ordinary drug treatments. To use it routinely would probably cause more loss of chair time than would be saved by the slightly more rapid elimination of viable organisms from the area. Claims which have been made to the effect that one treatment by electro-medication will routinely eliminate infection from root canal and periapical areas are entirely unsound. In many instances several electro-medication treatments will be required before negative cultures are obtained.

**Q.** What drugs are useful in the con-

trol of the pain which occasionally follows endodontic procedures?

A. For the milder types of pain the use of the antipyretic group will usually suffice. Acetylsalicylic acid (aspirin) is the safest of this group though certain individuals are sensitive to it and cannot take it. The official dose is 0.3 Gm. (5 grains) but most adults may be given a 0.6 Gm. initial dose followed by 0.3 Gm. every hour if needed. Acetophenetidin may be used when aspirin does not control the pain but it is potentially more toxic and therefore must be used with greater caution. The dose is 0.3 Gm. and may be repeated at intervals of 3 hours. Whether mixtures of acetylsalicylic acid, acetophenetidin and caffeine are superior to the individual drugs is not clearly established. However, analgesics should not be prescribed or dispensed in a way that will encourage the patient to use them for self-medication.

When the more severe types of pain occur, codeine orally is best suited for the ambulatory patient. The official dose is 0.03 Gm. (½ grain) but it may be desirable to give 0.06 Gm. to adults to be followed by 0.03-gram doses at intervals of 3 hours when pain is severe. Some clinicians prefer to give codeine in combination with acetylsalicylic acid or acetophenetidin. They may be given together by prescription or they may be alternated. Morphine, 8 to 10 mg. (⅛ to ⅙ grain) is more effective for the control of severe pain but is not desirable for the ambulatory dental patient because of its well known side effects. Some substitutes for morphine are now under clinical trial but they are not yet evaluated for use in dentistry.

## COUNCIL LISTS PRODUCTS FOR "ACCEPTED DENTAL REMEDIES"

THE Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following products in the list of *Accepted Dental Remedies*:

### Anesthetics—Local[1]

*Procaine HCl 2%, Neo-Synephrine 1:2500—Anestex:* Each cubic centimeter is stated to contain procaine HCl, 0.02 Gm.; phenylephrine HCl, 0.0004 Gm.; chlorobutanol, 0.005 Gm.; sodium chloride, 0.0005 Gm.; potassium sulfate, 0.003 Gm.; sodium thiosulfate, 0.001 Gm.; sodium bisulfite, less than 0.00067 Gm.; in distilled water. Marketed in 2.4 cc. ampuls. Manufactured by Anestex Laboratories, Pittsburgh.

*Procaine HCl 4%, Epinephrine 1:60,000—Holtz:* Each cubic centimeter is stated to contain procaine HCl, 0.04 Gm.; epinephrine, 0.0000167 Gm.; sodium bisulfite, 0.0019 Gm.; sodium chloride, 0.0007 Gm.; in distilled water. Marketed in 2.3 cc. ampuls. Manufactured by Holtz Chemical Co., Pittsburgh.

*Procaine HCl 2%, Epinephrine 1:50,000—Merit:* Composition: See Holtz Chemical Co., *A.D.R.*, ed. 14, p. 51. Distributed by Merit Dental Co., Philadelphia.

*Procaine HCl 2%, Epinephrine 1:50,000—Lee:* Composition: See Exodontia

1. *A.D.R.*, ed. 14, p. 39.

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Products Co., *A.D.R.*, ed. 14, p. 51. Distributed by Lee Dental Supply, San Francisco.

*Procaine HCl 4%, Epinephrine 1:50,000—Abbott:* Each cubic centimeter is stated to contain procaine HCl, 0.04 Gm.; epinephrine, 0.00002 Gm.; sodium bisulfite, 0.001 Gm.; potassium sulfate, 0.0025 Gm.; sodium formaldehyde sulfoxylate, 0.0005 Gm.; in distilled water. Marketed in 2 cc. ampuls. Manufactured by Abbott Laboratories, North Chicago, Ill.

*Procaine HCl 2%, Epinephrine 1:50,000—"Denpules" Brand:* Composition: See Holtz Chemical Co., *A.D.R.*, ed. 14, p. 51. Distributed by Heinsheimer Dental Supplies, Philadelphia.

*Procaine HCl 2%, Epinephrine 1:25,000—Lincoln:* Each cubic centimeter is stated to contain procaine HCl, 0.02 Gm.; epinephrine, 0.00004 Gm.; sodium chloride, 0.005 Gm.; sodium bisulfite, 0.0019 Gm., and distilled water.

*Procaine HCl 2%, Epinephrine 1:50,000—Lincoln:* Each cubic centimeter is stated to contain procaine HCl, 0.02 Gm.; epinephrine, 0.00002 Gm.; sodium chloride, 0.005 Gm.; sodium bisulfite, 0.0019 Gm., and distilled water. Distributed by Lincoln Dental Supply Co., Philadelphia.

### Barbiturates[2]

Pentobarbital Sodium, U.S.P. (See *A.D.R.*, ed. 14, p. 25.)

*Pentobarbital Sodium Capsules ¾ grain, 1¼ grains (Pembules).*

*Pembrin:* Each tablet is stated to contain pentobarbital, 0.45 grain, and aspirin, 5 grains. Manufactured by Novocol Chemical Mfg. Co., Inc., Brooklyn.

*Nembutal Sodium:* A brand of pentobarbital sodium, U.S.P.

*Sterile Powder Nembutal Sodium:* Marketed in ampuls, 0.25 Gm., 5 cc.; 0.5 Gm., 10 cc. and in vials, 0.5 Gm., 20 cc.

*Capsules Nembutal Sodium, ½ grain, ¾ grain, 1½ grains.*

*Sterile Solution Nembutal Sodium, 0.25 Gm.:* Each 5 cc. is stated to contain nembutal sodium, 0.25 Gm.; propylene glycol, 1 cc.; alcohol, dehydrated, 0.5 cc., and water for injection, to make 5 cc. Marketed in 5 cc. ampuls.

*Sterile Solution Nembutal Sodium, 50 mg. per cc.:* Each cubic centimeter is stated to contain nembutal sodium, 50 mg.; propylene glycol, 0.2 cc.; alcohol, dehydrated, 0.1 cc., and water for injection, to make 1 cc. Marketed in 50 cc. multiple dose vials.

*Suppositories Nembutal Sodium, ½ grain, 1 grain, 2 grains and 3 grains.*

*Nembutal:* A brand of pentobarbital.

*Elixir Nembutal:* Each fluidounce is stated to contain nembutal, 1.82 grains [representing nembutal sodium, 2 grains (0.12 Gm.)]; alcohol, 25 per cent; saccharin; flavor; Yerba Santa base; sweetose liquid, and caramel. Marketed in 4 fluidounce, one pint and one gallon bottles.

*Capsules Nembutal and Aspirin:* Each capsule is stated to contain nembutal sodium, ½ grain (as nembutal, 29.6 mg.); acetylsalicylic acid, 5 grains; corn starch, 51 mg.

*Nembutal Calcium:* A brand of pentobarbital calcium.

*Tablets Nembutal Calcium, ½ grain, ¾ grain, 1½ grains.*

*Enterab Tablets Nembutal Calcium, ¾ grain, 1½ grains.* Manufactured by Abbott Laboratories, North Chicago, Ill.

### Anesthetics—Local—Slightly Soluble[3]

*Paracain Brand Benzocaine Solution 10%:* Each 100 cc. is stated to contain benzocaine, 10 Gm.; propylene glycol,

2. *A.D.R.*, ed. 14, p. 22.
3. *A.D.R.*, ed. 14, p. 57.

87.7 Gm.; clove oil and cassia oil, 0.2 Gm., and certified color. Manufactured by Proco-Sol Chemical Co., Inc., Philadelphia.

### Fluorine-Containing Substances[4]

*Flursol:* Each 100 cubic centimeters contains sodium fluoride, 2 Gm., in distilled water. Distributed in plastic containers (2 oz.) or wax-lined bottles (1 quart). Manufactured by Novocol Chemical Mfg. Co., Inc., Brooklyn.

### Antibiotics and Antiseptics[5]

*Rapid/Repository Penicillin (Crystalline Penicillin G Procaine and Buffered Crystalline Penicillin G Potassium for Aqueous Injection):* Each single dose vial is stated to contain crystalline penicillin G procaine, 352,450 units; crystalline penicillin G potassium, 117,500 units; sodium citrate; sodium carboxymethylcellulose, and Tween 80. In 1, 5 and 10 dose vials. Manufactured by Abbott Laboratories, North Chicago, Ill.

*Penicillin G Potassium Chewing Troches, 20,000 Units:* Stated to contain penicillin G potassium, paraffin wax, lactose, saccharin, color and flavor. In boxes of 6.

*Penicillin G Potassium Troches Soluble, 5,000 Units:* Stated to contain penicillin G potassium, karaya gum, magnesium stearate, acacia, mineral oil, sucrose powder and flavoring. In boxes of 24 and 100. Manufactured by E. R. Squibb & Sons, New York.

### Quaternary Ammonium Compounds[6]

*Benzalkonium Chloride Aqueous Solution 12.8%:* Benzalkonium chloride, 12.8 per cent; water, 87.2 per cent. (This is a concentrated dosage form, intended for dilution with distilled water.) Distributed by Professional Products Company, San Diego, Calif.

Admission to *Accepted Dental Remedies* means that the product was found to conform to the rules of the Council when it was accepted. Accepted products are reconsidered periodically. The files of the Council contain information on many drugs and dental cosmetics, and inquiries are welcomed.—*Donald A. Wallace, Secretary.*

4. *A.D.R.*, ed. 14, p. 70.
5. *A.D.R.*, ed. 14, p. 59.
6. *A.D.R.*, ed. 14, p. 94.

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# CURRENT LITERATURE

**Reactions to Penicillin.** Samuel I. Kaplan and George Hurwitz. Oral Surg., Oral Med. & Oral Path. 2:21, January 1949.

The authors discuss the incidence and types of unfavorable reactions to penicillin encountered among 203 injections to 113 dental patients.

Fourteen patients manifested reactions which were attributed to an oil and wax vehicle for the antibiotic (local inflammation at the injection site accompanied by fever and occurring eight to ten days after treatment). Twelve of the reactions occurred among the 77 women, while only two reactions occurred among the 36 men. A possible correlation between the higher incidence in women and the larger lipoid deposits in their buttocks is suggested.

The incidence of "true" penicillin reactions (allergic manifestations closely resembling serum sickness and delayed in onset) was but four cases. The seriousness of this type of reaction is recognized and methods of management are suggested.—*S. C. Harris.*

**Tumors of the Hard Tissues of the Oral Cavity With Special Reference to Children.** Harold A. Maxmen. J. Den. Children 15:6, Fourth Quarter, 1948.

The author gives a short description of the differences between benign and malignant tumors, as well as a brief résumé of the causes of tumors.

Benign tumors are considered first. The discussion of odontomas includes classification, description, etiology, treatment and prognosis. Odontomas are generally found in the younger groups and arise from developing dental tissue cells.

Malignant tumors of the jaw, namely, the osteosarcoma and the carcinoma, are outlined with description, etiology, treatment and prognosis. The osteosarcoma is of more importance, as it occurs far more frequently in the younger group than the carcinoma.

The author emphasizes that tumors are frequent in children, that the diagnosis must differentiate between inflammatory tumors and true neoplasms, and that many tumors may be discovered while still symptomless. Irritating factors and residual infections must be eliminated. Caustic drugs are condemned in removal of growths, since all new growths should be regarded as malignant until proved otherwise. When a suspicious-looking lesion is observed, the patient should be informed and directed into proper channels.—*Herbert W. Fleege.*

**An Evaluation of Nitrous Oxide and Pentothal Sodium Anesthesia in the Practice of Oral Surgery.** Stewart Everson. Oral Surg., Oral Med. & Oral Path. 2:24, January 1949.

The author states, "Nitrous oxide has been used by the majority of the members of the dental profession as an anesthetic agent since its introduction over a century ago." The article is directed toward a re-evaluation of the place that nitrous oxide-oxygen should occupy in dental general anesthesia. The great danger of hypoxia in the administration of this agent is emphasized, and Everson expresses the opinion that thiopental ("Pentothal") sodium anesthesia supplemented with nitrous oxide is safer. He discusses the complications that may occur in thiopental sodium anesthesia, and indicates that the anesthetist who administers this drug should have resuscitative measures at hand and be skilled in intubation so that he may alleviate laryngospasm if it should occur.

The reviewer agrees that a very young child should not be given thiopental sodium for oral operations. However, if anesthesia is on the extremely light surgical plane and of short duration, the danger of hypoxia when the average dentist gives nitrous oxide-oxygen anesthesia is a less serious consideration that the complications which might arise were he to give thiopental sodium combined with nitrous oxide.—*Warren Rand Schram.*

**The Temporomandibular Joint: A Consideration of Its Probable Functional and Dysfunctional Sequelae and Report: Condyle—Double Head—in a Living Person.** Mayer B. A. Schier. D. Items Interest 70:779, August 1948; 70:899, September 1948; 70:1034, October 1948; 70:1095, November 1948; 70:1193, December 1948; 71:21, January 1949.

The temporomandibular joint is of such great importance in all phases of dental practice that this elucidating study should be of value to all dentists. Schier deplores the vast amount of misinformation being presented to the profession by individuals who are merely perpetuating unchecked results. He attempts in an intense, evaluating study to clear the mist about the temporomandibular joint and offers basic concepts for sound progress.

A review of the anatomy of the joint and its possible etiologic contributions to reflex manifestations and auditory changes is presented. The results of a tabulation of more than a thousand ear impressions (including the auditory meatus), comparing both ears of the same patients, revealed that frequently the ears with more uniform meatuses manifested greater auditory disturbances than those mates of more sinuous, elliptic or exaggerated "S" shapes.

A new roentgenographic technic for study of the temporomandibular joint is offered, in which an angular projection for the ray of incidence is obtained for the individual articulations of each patient. The superiority of this method is supported by comparative roentgenograms. The revelation of a double-headed condyle in a living patient (impossible by other methods, Schier says) is a classic example of the accuracy and scientific approach of this technic.

The elements involved in maxillomandibular relations in oral reconstruction are extensively reviewed. The author's advocacy of the physiologic rest position as a starting point is substantiated by recently published research of others. Case histories of patients with various temporomandibular disorders are presented which demonstrate the author's basic concepts concerning the relations of the temporomandibular joint, reflex manifestations and joint disturbances.

Perhaps the most interesting part of the paper is the chapter called "Hypothetics." Here the author offers theories resulting from research and practical clinical observations over a period of twenty years. From his experience he tells us, "It should be evident to anyone cognizant of elemental physics and anatomy, that anything a dentist would do could not materially alter the condylar relationships to such magnitude as to change or enlarge the inner osseous portions of the meatus, restore auricular tissue collapse, or increase the potential of sound intensity through the ear canal."

In regard to temporomandibular disorders, Schier strongly maintains that "fundamentally the etiology begins in the function or dysfunction originating within the confines of the glenoid fossa and its harmony or disharmony within the elements of the trinity of which it is a part, to wit, the joint structures, the teeth, and the supporting alveoli." He also insists that the subjective and objective symptoms noted by dentists are merely the end results of years of neuromuscular and neurovascular accompaniment of unobserved dysfunction.

Careful consideration of the paper leads me to the conclusion that there are no short cuts to resolution of the problems of the temporomandibular joint, no sudden dawning of light in the darkness. There is only the need for study, for trial and error, and for unremitting honest research.—*Nathan Stowe.*

**Hypertrophy of the Gum Associated With Epanutin Therapy.** A. Frank Stammers and J. F. Bromley. Brit. D. J. 86:10, January 1949.

Hypertrophy of the gingiva occurs frequently in patients undergoing treatment with "Epanutin" (diphenylhydantoin sodium). The condition is benign and toxic.

A 22 year old white man had taken 1½ grains of diphenylhydantoin sodium three times a day for three years to control epileptic seizures. Gingival tissue was firm and normal in color. Interdental papillae were enormously hypertrophied. Conservative treatment did not eliminate the condition and surgery did not prevent its recurrence.

A calculated dosage of 1,500 roentgens was given three months after a maxillary gingivectomy. Nine months later similar roentgen treatment was given immediately after mandibular gingivectomy. No recurrence of hypertrophy was noted in nine months.—*G. D. H.*

**Amyloid Heart Disease.** Joseph Ballinger. Am. J. M. Sc. 217:308, March 1949.

Heart disease and intractable heart failure may be caused by the infiltration of amyloid material into the heart. The primary type exhibits a marked affinity for smooth and striated muscles, especially those of the myocardium, tongue, skin and blood vessels. The clinical diagnosis may be established by demonstration of amyloid material at biopsy of

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tissue from the tongue or other skeletal muscle, buccal mucosa or skin.—*S. Leonard Rosenthal.*

**Newer Advances in Sprue.** David Adlesburg. Oral Surg., Oral Med. & Oral Path. 1:1109, December 1948.

Sprue involves an interference with the passage of fatty material through the membrane of the intestinal cell. Forty nontropical cases were studied and divided into primary and secondary types which could be differentiated by clinical and laboratory data.

Primary sprue is long standing with history of remission and variations in diagnosis. Organic disease cannot account for its symptoms, which include severe glossitis and stomatitis. Secondary sprue is rapidly debilitating and well known pathologic changes are apparent. Diagnosis usually is made before oral changes appear, although hemorrhages of the mouth, skin and genito-urinary tract are characteristic of severe sprue.

Treatment consists of high protein, nonfat diet fortified with vitamins and folic acid.—*G. D. H.*

**Medicine in Relation to Dentistry.** John A. Kolmer. Ann. Den. 7:39, June 1948.

Periodontal lesions, pulp degeneration, residual infection, cysts and chronic osteomyelitis of the jaws are evaluated in relation to possible systemic conditions and diseases. Further discussion embraces in some detail the dental aspects of rheumatoid arthritis, primary hypertension, angina pectoris, coronary sclerosis, myocardial infarction, congestive heart failure, agranulocytosis, leukemias, purpuras, hemophilia, jaundice, diabetes mellitus, allergy, acquired syphilis and epilepsy.—*Kenneth N. Morrison.*

**The Effectiveness of an Adequate Diet in the Control of Dental Caries.** Genevieve Stearns. J. D. Res. 27:397, June 1948.

If nutrition is related to dental caries, it appears probable that the nutritional factors most apt to be involved are those which normally are absorbed with some difficulty, that is, those factors less soluble in a watery medium. Such substances include the fats, the fat-carried vitamins (A, D, E and K) and the polyvalent minerals (calcium, phosphorus and iron).

Again, if the incidence of caries is related to the state of nutrition, we should expect the greatest incidence of caries during or shortly after periods of nutritional stress. Such periods occur at any age during illness, especially during chronic illnesses, though they be low-grade infections. Other known periods of stress are: (1) the periods of rapid growth preceding puberty, (2) lactation and (3) menopause. The incidence of dental caries is usually considered to be increased at about puberty. The incidence at other periods of stress could well be studied.

In evaluating the relation of nutrition to dental caries it is important to know the nutritional history of the subjects. Improvement of the diet in one respect only cannot be expected to bring improvement in caries incidence if the diet as a whole remains hopelessly below standard, or if the patient is chiefly deficient in a material other than the one supplied. The effectiveness of vitamin D, in particular, cannot be determined unless it is proved that the calcium and phosphorus intake is sufficiently high to permit an increase in retention through the action of the vitamin.

When several factors of the dietary regimen have been altered, results cannot be ascribed to only one factor. That seems so obvious as to be trite, but still it is the most common error in research reports.

At the State University of Iowa, keeping children under strictly controlled dietary regimens, complete arrest of caries has been observed with diets high in sugar, and with diets low in sugar but always nutritionally adequate and well absorbed. From nutritional studies on normal children, it has been concluded that the longer a child remains in a state of poor nutrition, the longer it takes for him to utilize a good diet when he eats it. Often many months must elapse before the child becomes well nourished. Under these conditions, it is slight wonder that many investigators feel that diet is not a major factor in the prevention of dental caries. Stearns believes that the state of nutrition, rather than diet, is an important factor in the incidence of dental caries.

**Schematic Drawings for Illustrating Technical Procedures.** Carl Philip Regli. J. D. Educ. 13:145, March 1949.

Outline drawings on a blackboard are the most acceptable method of presenting information, but they are time consuming and their

quality depends on artistic ability. The colored schematic drawing may be considered as a simple line drawing in which the third dimension has been simulated by shading and emphasis of detail accomplished by use of color.

For presentation to large groups, reproductions on the 35 mm. "Kodachrome" transparency may be used. The method for preparing two-color drawings is as follows:

1. Draw outline of the object and detail to be emphasized.

2. Place transparent paper over the outline drawing and cut away the area to be airbrushed.

3. Apply color to exposed area.

4. When color is dry, cut away the frisket to expose a second area, and apply color with the airbrush. It may be necessary to replace the portion of the frisket previously cut away before applying a second color.

5. Remove remainder of frisket and complete the illustration by titling and shading. Letters may be placed easily with a hand lettering set.—*T. F. Pett.*

**Surgical Correction of Deformities of the Mandible.** Douglas B. Parker. Am. J. Orthodont. 4:35, April 1949.

Deformities of the jaws naturally become facial deformities because the jaws are the skeletal framework on which the soft tissues of the face depend for much of their contour. The two principal methods of correcting mandibular deformities are osteotomy performed in a variety of locations and ostectomy of the body of the mandible.

The first essential to any of the technics of surgical intervention is the making of accurate plaster models which may be set up on an articulator for the more intimate study of the occlusion. By shifting the mandible posteriorly on the articulator, it can readily be determined whether the maxilla and the mandible can be articulated into a more practical occlusal relation.

In the operation of osteotomy for correction of the prognathous mandible, the ramus is severed on each side and the mandible is carried back and immobilized in the desired relation with the maxilla. The disadvantages of this operation are: it is a somewhat blind procedure that does not allow visualization of the structures cut through, so that hemorrhage may be a problem; it is difficult to keep the two cut surfaces of the ramus in apposition so that good union of the bone is secured.

Ostectomy for the correction of prognathism has been employed by some maxillofacial surgeons, but more often by the general or plastic surgeon. The operation is performed by extracting a molar or bicuspid on each side and then removing a section of the body of the mandible on each side by an extraoral approach through the lower border of the mandible. The distance that the symphysis should be carried can, of course, be predetermined by sawing through the models and removing a section so that the teeth will occlude in the proper relation.

The mandible should be immobilized after either osteotomy or ostectomy for a least eight weeks as a rule.

Micrognathia, in which the mandible is underdeveloped and the chin recedes, presents a major deformity. While orthodontic treatment can accomplish a great deal in realigning the teeth and improving the bite, it will not materially change the inclination of the underdeveloped chin or the length of the body of the mandible. After maximum orthodontic treatment has been completed, the appearance may be improved by surgical procedures. The simplest way is to restore the fullness and contour of the chin by means of a graft or an implant.—*William F. Ford.*

**Oral and Environmental Factors as Etiological Factors in Malocclusion of the Teeth.** John R. Thompson. Am. J. Orthodont. 1:35, January 1949.

At one time the first step in treatment of malocclusion was considered to be the elimination of the causative factor. Now the difficulties of explaining the cause and sequence of events are recognized. Evaluation of the existing condition as seen in abnormalities of tooth size and position, arch form and arch length; relations of the dentitions to each other and to their respective "basal" bones; muscular balance and function, and finally deviation from normal function receives priority over subjective reasoning as to "how it all came about."

The scope of oral and environmental factors is enlarged to include the direct impact of a disturbing factor or combination of factors on any part or parts of the developing oral mech-

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anism. The oral mechanism includes the teeth and their direct supporting tissues, the mandible and maxilla proper, the temporomandibular articulation and the associated musculature with its nerve and vascular supply. It is considered not only in its static state but also from the viewpoint of development and function. During growth the component parts are highly coordinated to produce an enlarging but relatively stable pattern. Severe impacts of a local nature will alter the pattern in its entirety, and less severe impacts will alter parts, such as the occlusion of the teeth, without disturbing the over-all skeletal pattern. Destruction or retardation of the condylar growth center, unilateral or bilateral, will result in progressive deformation of the growth pattern with secondary alteration in all parts of the oral mechanism.

For years dentists have accepted the occlusal relation of the teeth as indicative of the relation of the mandible to the maxilla. Very often this does not give the true picture. The rest position of the mandible cannot be overlooked in the analysis and correction of malocclusion. This functional analysis of occlusion is based on the concept that the position of the mandible is established fundamentally by the musculature. Since the rest position is quite stable and since the normal part of the occlusion is known, these can be used as a diagnostic aid for determining normal mandibular position when the teeth are in occlusion.

The displacement that occurs in a larger percentage of Class II cases probably explains the difference in clinical response that has been observed by practicing orthodontists and often attributed to growth, types of appliances and particular methods of treatment. Certainly the true Class II malocclusion (normal path of closure from rest position to occlusion) will not respond as rapidly as one that exhibits a considerable amount of displacement. They are not identical cases and they require different treatment. Only a functional analysis will reveal the true nature of the malocclusion. —*William F. Ford.*

**Creating Space for Teeth.** Arthur Thornton Taylor. Austral. J. Den. 53:3, January 1949.

The method presented is designed to gain dimension within the dental arches by use of Angle tie bracket bands and round labial arches, with the introduction of auxiliaries to overcome certain technical difficulties. The postulates are: (1) one plane of force, (2) continuous and easy application of force, (3) minimum of opposing forces and (4) a technic capable of being supplemented by or associated with intermaxillary anchorage.

The tube spring auxiliary may be used independently or in conjunction with a full appliance and consists of a male and female sliding lingual arch soldered usually to the bicuspid bands and carrying a push coil spring on the male portion.

The *T* sleeve, as its name implies, is a tube and wire in the form of a *T*, working from a labial arch and so disposed as to bear on the mesial wall of any tooth against which it is placed. When activated by spiral spring compression or elastic traction, or both, a distal stimulus is effected on the tooth to which it is attached and all teeth posterior to it.

**Retention With a New Type of Retainer Designed to Improve the Retentive Qualities of the Retainer.** Walter J. Straub. Am. J. Orthodont. 35:25, January 1949.

A retainer has been designed which has, instead of clasps, a loop that lies over the tissue and contacts the tooth only below the height of contour. A minimum amount of wire is visible, and it is difficult for the patient to bend, break or distort the wire.

This retainer is not the "cure all" for retention, but merely a step toward the solution of the problems faced when bands are removed after corrective treatment. There are certain qualifications that a retainer should possess in order to serve its purpose efficiently:

1. It should hold the teeth securely in their new positions without tension, unless slight active movement by means of auxiliary clasps or springs is desired.

2. It should be a sturdy, well-constructed appliance that is easily removed for cleaning by the patient, and it should be as inconspicuous as possible.

3. It should resist dislodgement by the patient's tongue.

The labial wire arrangement on the upper arch is designed to hold the four incisor teeth in contact and the cuspid distally. If desired, the loop can be expanded to exert distal force against the posterior teeth and tighten the contacts between bicuspids and molars. If bi-

cuspids have been extracted, the loop can be placed against the distal surface of the remaining bicuspid for retention. In this position the loop will help to keep the spaces closed. On the lower arch there are few wires visible or in contact with the teeth.

The new design permits the retainer to be both tissue- and tooth-borne, gripping the teeth firmly without causing adverse manifestations of force. This eliminates most of the slight relapses formerly caused by retainers riding high.—*William F. Ford.*

**Carcinoma of the Lip. Preliminary Analysis of 330 Cases With Follow-up of From 3 to 36 Years.** Joseph L. Bernier and Mardelle Clark. Military Surgeon 102:474, June 1948.

The authors report on the clinical behavior and pathologic features of lip carcinoma in a group of men, average age 33.6 years, selected by the Army as generally above average in physical health. The diagnoses of these 330 cases of squamous cell carcinoma were confirmed by microscopic examination.

Squamous cell carcinoma of the lip has many varieties, any of which may be complicated by secondary infection and trauma. It sometimes cannot be distinguished clinically from leukoplakic lesions, which are often the precursors of cancer. No lesions should be considered as genuine lip cancer except those arising in the "red of the lip" (area between the cutaneous portion of the lips and their line of closure). The two main types are papillary and ulcerating or infiltrating.

Possible etiologic factors are trauma, irritation, climate (exposure to sunlight) and familial susceptibility. Eighty-seven per cent of the patients smoked cigarettes, 12 per cent smoked pipes and 10 per cent smoked cigars.

Kahn or Wassermann tests were negative in 96 per cent of the patients, positive in 3.3 per cent and doubtful in 0.7 per cent. Secondary pathologic diagnoses were recorded for only 20 per cent of the patients, but two-thirds of that group had leukoplakia of the lip, and nearly one-fourth had reactive cervical lymph nodes. Scars on the lip were noted in three patients, radiation effect in two and foreign body reaction and chronic granuloma in one each.

The largest dimension of the lesions ranged from 0.1 to 2.8 cm., with an average size of 0.83 cm.

Excision was employed in removing the initial lesion of 299 of the 329 patients whose treatment was recorded. Radium or x-rays were used in treatment of the others. Follow-up of 220 treated carcinomas after intervals of 3 to 36 years revealed 13 recurrences. Thirty-one patients reported metastatic carcinomas in lymph nodes.

Eighty-six per cent of the lesions were relatively benign in character. Forty-eight per cent were verrucous in form and 52 per cent were flat. Sixty per cent appeared to have been completely removed. Senile elastosis was present in nearly three fourths of the 293 carcinomas of which suitable slides were available for determining this point. Muscle invasion was present in approximately half of the patients, and did not seem to be related to the degree of malignancy. The proximity of the orbicularis oris muscle to the surface indicates this point cannot be considered important in determining the degree of invasiveness of lip carcinomas.

Lip carcinoma, which represents approximately 5 per cent of all carcinomas occurring in the oral regions, will show a high percentage of favorable results if it is detected and treated early. Although this series indicates that carcinoma of the lip may occur more frequently in young men than is popularly supposed, it is unlikely that it represents a high rate of occurrence in relation to the general population. As a rule lip carcinomas are of low-grade malignancy and are quite amenable to surgical removal which is, in most instances, preferable to radiation.—*James Springer.*

**Maxillo-Mandibular Relations in the Teaching of Denture Prosthesis.** George A. Hughes. J. D. Educ. 13:133, March 1949.

The author suggests that the professional schools should teach fundamental principles and stress precise technics, thus giving the graduate the most scientific methods available. He states that vertical dimension is individual and occasioned by development or hereditary influences; that the only true vertical dimension can be established by a pre-extraction record. Mandibular attraction and mandibular abstraction are demonstrated in photographs.

Hughes states that "vertical dimension" should refer to extraoral facial measurements while the term "denture space" should designate intraoral measurements. He follows

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Thompson's work on the free-way space and says that the facial contour of the lower third of the face is modified in moving from rest position to centric relation. Such variation accounts for errors in judgment in estimating the vertical dimension.

Since cephalometers are not readily available, the most practical means of establishing vertical dimension is a system of facial measurements, based on the individual types of patients.

Centric relation is treated as three dimensional, with the condyle in the most unstrained position in the glenoid fossa. The Gothic arch tracing is the only true check of centric relation.

Eccentric relation is defined as fundamental movements of the mandible away from or back to centric. There are three fundamental movements: right lateral, left lateral and protrusive. Balanced occlusion, which is dependent on evaluation of the eccentric relations of the mandible, enhances stability of the denture bases and minimizes the dislodging stresses. Actual chewing efficiency can be multiplied by lateral movements, using the cusps as a cutting tool. Proper milling of the dentures enhances this effect.

Hughes states that the Terrill and House articulators seem to fulfill most requirements, but the broken axis of the Terrill instrument is beyond the skill of the average student.

It must be recognized that satisfacory dentures have been and are being made by the trial and error method. Although they cannot teach judgment, teachers can give the student understanding of basic principles, thereby immeasurably improving denture prosthesis and placing it in a health program rather than a sales-service for commercial laboratories.—*T. F. Pett.*

**The Experimental Basis for the "Bone Factor" Concept in Periodontal Disease.** I. Glickman. J. Periodont. 20:1, January 1949.

This paper presents the bone factor concept and the results of a combined autopsy and experimental study on which the concept is based. Glickman has rested his case on observations that alveolar bone is similar morphologically to bone elsewhere in the body.

The bone destruction associated with human periodontal disease was not found to be "peculiar to alveolar bone," but "could be demonstrated elsewhere in the skeletal system." Furthermore, after study of the bone in regions of gingival inflammation it was seen that the bone loss which occurred was a resultant of formation and destruction, rather than a simple resorption process.

Groups of experimental rats were subjected to acute vitamin C deficiency and to experimental diabetes mellitus (alloxan diabetes). The vitamin deficiency produced a breakdown of both periodontal membrane and alveolar bone, whereas the diabetes resulted in changes in the alveolar bone alone. Gingival inflammation was experimentally superimposed in animals of both groups. It was felt that neither the incidence nor the severity of bone destruction was necessarily related to the ensuing gingival changes.

Glickman gave the term "bone factor" to the "systemic regulatory influence" which governs the response of alveolar bone to external stimuli. The factor can either increase or reduce the effects of a local stimulus. Moreover, loss of periodontal bone was found to occur even in the absence of harmful local factors when the "bone factor" was sufficiently altered.

This newly defined concept does not make for the continued classification of every periodontal case on the basis of a purely local or a purely systemic origin. Periodontal disease is always greatly influenced by the systemic factor which controls bone formation in a given individual.

Though entitled "The Experimental Basis for the 'Bone Factor' Concept" this paper does not appear to present sufficient experimental data. Had there been included further details of the material and findings the analysis might have carried more immediate conviction.—*A. L. Ogilvie.*

## LIST OF DENTAL OFFICERS

## SEPARATED FROM ARMY DENTAL CORPS

THE following list of dental officers separated from the Army Dental Corps does not include rank because such information is no longer furnished by the Surgeon General's Office. Publication will be given to other names as soon as possible.

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| Wolfson, Sumner Jordan | Brookline, Mass. |
| Wong, Wilfred Michael Wah | San Francisco |
| Wonson, Carroll Walen | Gloucester, Mass. |
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| Yamanoto, George Masao | Stockton, Calif. |
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| Yarett, Jerome W. | New York |
| Yee, Ernest, Jr. | Sacramento, Cal. |
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| Zonana, Jack Nathaniel | New York |
| Zucco, Bertram Francis | San Francisco |

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# DEATHS

Alldritt, Earl C., Wichita, Kan.; College of Dentistry, University of Nebraska, 1912; died May 31.

Allen, Dwight, Honeoye Falls, N. Y.; School of Dentistry, University of Buffalo, 1902; died May 7; aged 69.

Allensworth, Carl A., Canton, Ohio; College of Dentistry, Ohio Medical University, 1903; died May 10; aged 76.

Anderson, J. M., Saybrook, Ill.; Dental School, Northwestern University, 1897; died May 31; aged 83.

Anderson, Vernon I., Salt Lake City; College of Dentistry, University of Southern California, 1928; died May 30; aged 47.

Bacon, Charles L., Denver; School of Dentistry, University of Denver, 1924; died April 21.

Barrett, Frank W., Cleveland; School of Dentistry, Western Reserve University, 1908; died April 29; aged 65.

Battaglia, Pasqual J., Niagara Falls, N. Y.; College of Dentistry, University of Tennessee, 1918; died May 22; aged 55.

Bischof, Henry E., Kenmore, N. Y.; New York College of Dentistry, 1892; died May 13; aged 81.

Blue, James A., Mobile, Ala.; Birmingham Dental College, 1905; died June 8.

Blyler, Harper W., Lebanon, Pa.; Philadelphia Dental College, died June 3.

Boller, O. F., Washington, Iowa; College of Dentistry, University of Iowa, 1908; died May 13; aged 62.

Brady, Charles T., Chicago; Dental School, Northwestern University, 1912; died May 4, aged 57.

Brown, Guy E., Cambridge, Mass.; Tufts College Dental School, 1912; died May 18; aged 60.

Brunson, Edward T., Des Moines, Iowa; died May 8; aged 80.

Bryer, Russell K., Newport, R. I.; School of Dentistry, University of Pennsylvania, 1904; died May 26; aged 73.

Bullard, Frank J., Rushville, Neb.; died April 16; aged 44.

Cartwright, O. D., Muskogee, Okla.; died May 13.

Casto, Theodore D., Philadelphia; Philadelphia Dental College, 1895; died May 17; aged 79.

Chisholm, William R., Florence, Ala.; School of Dentistry, Vanderbilt University, 1898; died May 23; aged 74.

Costales, Alfred W., Hartford, Conn.; New York College of Dentistry, 1905; died May 19; aged 70.

Davis, Joseph B., Jackson, Miss.; New Orleans College of Dentistry, 1903; died May 30; aged 74.

Diltz, David A., Warsaw, N. Y.; School of Dentistry, University of Buffalo, 1904; died May 10.

Dittmar, G. Walter, Chicago; Dental School, Northwestern University, 1898; died May 25; aged 77.

Doyle, M. H., Belle Plaine, Minn.; College of Dentistry, University of Minnesota, 1905; died May 20.

Eckman, Carl, Winthrop, Minn.; College of Dentistry, University of Minnesota, 1913; died May 19; aged 57.

Flagstad, Carl O., Minneapolis; College of Dentistry, University of Minnesota, 1911; died June 16.

Flynn, Eugene V., Kersey, Pa.; Department of Dentistry, Medico-Chirurgical College of Philadelphia, 1908; died May 19.

Freeman, Arthur T., Boston; Dental School, Harvard University, 1902; died April 25.

Gulstine, Herman P., Madison, S. D.; Dental School, Northwestern University, 1908; died April 17; aged 65.

Gunter, B. H., New Orleans; School of Dentistry, Tulane University of Louisiana, College of Medicine, 1924; died May 19; aged 57.

Hadley, George A., Kansas City, Mo.; died May 11; aged 68.

Harshbarger, Holmes G., Avondale, Ohio; died May 13; aged 65.

Haskett, Vernon C., Bloomington, Ind.; Indiana Dental College, 1912; died May 23; aged 60.

Havely, A. T., Girard, Kan.; Kansas City Dental College, 1892; died May 11; aged 77.

Jones, Claude C., Rayville, La.; died February 25; aged 66.

Murphy, John, Fairmont, W. Va.; died April 22; aged 56.

Murphy, R. H., Augusta, Ga.; died April 25; aged 52.

Trager, Frank A., Riverside, Ill.; died March 8; aged 69.

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**Clinics:** Willard H. Hurley, Selling Bldg., Portland, Ore.
**Full Denture Prosthesis:** Carl O. Boucher, College of Dentistry, Ohio State University, Columbus 10, Ohio.
**Hospital Dental Service:** Sanford M. Moose, 450 Sutter St., San Francisco.
**Operative Dentistry:** Alexander Jeffery, Medical and Dental Bldg., Seattle.
**Oral Surgery:** Van B. Dalton, 116 Garfield Place, Cincinnati.
**Orthodontics:** F. Copeland Shelden, 315 Alameda Rd., Kansas City, Mo.
**Partial Denture Prosthesis:** Robert P. Dressel, School of Dentistry, Western Reserve University, Cleveland.
**Pedodontics and Oral Hygiene:** Ralph L. Ireland, College of Dentistry, University of Nebraska, Lincoln, Neb.
**Periodontia:** James E. Aiguier, Medical Arts Bldg., Philadelphia.
**Practice Management:** Robert L. Borland, 756 S. Broadway, Los Angeles.
**Research:** Ellis B. Jump, Dental School, University of Oregon, Portland, Ore.
**Roentgenology:** Walter S. Thompson, 727 W. 7th St., Los Angeles.
**Scientific Exhibits (Dental Health Education Exhibits and Motion Pictures):** H. B. G. Robinson, School of Dentistry, Ohio State University, Columbus, Ohio.

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# ANNOUNCEMENTS

## MEETINGS OF STATE SOCIETIES

| State | Date | Place | Secretary | Address |
|---|---|---|---|---|
| Alabama | May 1-3, 1950 | Biloxi, Miss. | G. W. Matthews | 1922 Tenth Ave., S., Birmingham 5 |
| Arizona | | | H. G. DeWolf | Valley National Bank Bldg. Tucson |
| Arkansas | | | D. M. Hamm | White Bldg., Clarksville |
| California | April 24-26, 1950 | San Francisco | L. R. Ludwigsen | 450 Sutter St., San Francisco |
| S. California | April 3-5, 1950 | Los Angeles | M. E. Ralston | Medico-Dental Bldg., Pomona |
| Colorado | Oct. 4-7, 1950 | Colorado Springs | R. A. Downs | 724 Republic Bldg., Denver 2 |
| Connecticut | | | E. S. Arnold | 37 Linnard Rd., W. Hartford |
| Delaware | | | Norbert L. Gladnick | 1009 Madison St., Wilmington |
| D. of Columbia | | | K. H. Wood | 202-1835 Eye St., N. W., Washington |
| Florida | Nov. 10-12 | Palm Beach | L. M. Schulstad | Professional Bldg., Bradenton |
| Georgia | Nov. 13-15 | Savannah | J. M. Heard, Jr. | Persons Bldg., Macon |
| Hawaii | | | J. H. Dawe | P. O. Box 39, Honolulu 10 |
| Idaho | | | H. R. Packard | Idaho Falls |
| Illinois | | | P. W. Clopper | 623 Jefferson Bldg., Peoria 2 |
| Indiana | May 15-17, 1950 | Indianapolis | E. E. Ewbank | Kingman |
| Iowa | May 1-3, 1950 | Des Moines | H. I. Wilson | 639 Insurance Exchange, Des Moines |
| Kansas | May 7-10, 1950 | Kansas City, Mo. | F. A. Richmond | 1008 Huron Bldg., Kansas City |
| Kentucky | Mar. 29-31, 1950 | Louisville | A. B. Coxwell | 1976 Douglass Blvd., Louisville |
| Louisiana | April 14-16, 1950 | Monroe | J. S. Bernhard | 407 Medical Arts Bldg., Shreveport |
| Maine | | | P. W. Anderson | 32 Deering St., Portland 3 |
| Maryland | May 1-3, 1950 | Baltimore | E. L. Pessagno, Jr. | 415 Medical Arts Bldg., Baltimore 1 |
| Massachusetts | | Boston | A. M. Bommer | 349 Broadway, Revere |
| Michigan | April 24-26, 1950 | Detroit | F. Wertheimer | Michigan Dept. of Health, Lansing |
| Minnesota | Feb. 20-22, 1950 | St. Paul | C. V. E. Cassel | 242 Lowry Medical Arts Bldg., St. Paul |
| Mississippi | June 11-14, 1950 | Biloxi | F. C. Sneed | Osyka |
| Missouri | May 7-10, 1950 | Kansas City | R. R. Rhoades | 201 Merchants Bank Bldg., Jefferson City |
| Montana | | | C. S. Renouard | 304 Phoenix Bldg., Butte |
| Nebraska | May 8-10, 1950 | Omaha | F. A. Pierson | Federal Securities Bldg. Lincoln |
| Nevada | May 9-10, 1950 | Las Vegas | Clifford A. Paize | Boggs Bldg., Las Vegas |
| New Hampshire | | | F. E. Williams | 814 Elm St., Manchester |
| New Jersey | April 26-28, 1950 | Atlantic City | J. G. Carr | 407 Copper St., Camden |
| New Mexico | | | J. S. Eilar | First National Bank Bldg., Albuquerque |
| New York | June 5-8, 1950 | New York | C. A. Wilkie | 1 Hanson Place, Brooklyn |
| North Carolina | | | R. F. Hunt | Rose Drug Co., Bldg., Rocky Mount |
| North Dakota | May 7-10, 1950 | Fargo | A. L. Smeby | Northwood |
| Ohio | Nov. 13-16 | Columbus | E. G. Jones | 185 E. State St., Columbus |
| Oklahoma | April 16-19, 1950 | Tulsa | F. H. Binkley | Hennessey |
| Oregon | Mar. 6-8, 1950 | Portland | H. C. Fixott, Jr. | Medical Dental Bldg., Portland |
| Panama Canal Zone | | | R. O. Leon | Box 1094, Ancon |
| Pennsylvania | | | J. Wittek | 217 State St., Harrisburg |
| Puerto Rico | | | F. Guerra | Avenida Ponce de Leon, Santurce |
| Rhode Island | Jan. 17-18, 1950 | Providence | J. F. Colgan | 838 Newport Ave., Pawtucket |
| South Carolina | | | J. R. Owings | 201 E. North St., Greenville |
| South Dakota | May 14-16, 1950 | Huron | E. W. Elmen | Sioux Falls |
| Tennessee | May 8-10, 1950 | Chattanooga | E. J. Justis | Exchange Bldg., Memphis |
| Texas | April 23-27, 1950 | Dallas | W. Ogle | 313 Medical Arts Bldg., Dallas |
| Utah | | | H. R. Nordberg | 807 Tribune-Telegram Bldg., Salt Lake City |
| Vermont | May 22-24, 1950 | Woodstock | J. A. Larrow | Middlebury |
| Virginia | April 17-19, 1950 | Roanoke | J. E. John | 804 Medical Arts Bldg. Roanoke |
| Washington | | | F. J. Dingler | 1502 Medical-Dental Bldg., Seattle 1 |
| West Virginia | May 15-17, 1950 | Huntington | A. B. Drake | Huntington |
| Wisconsin | April 11-13, 1950 | Milwaukee | R. A. Mason | 964 N. 27th St., Milwaukee 2 |
| Wyoming | | | T. A. Ward | Casper |



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## MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

| State | Date | Place | Secretary | Address |
|---|---|---|---|---|
| Michigan | Jan. 29-Feb. 4<br>June 11-June 17 | Ann Arbor | J. L. Champagne | 502 David Whitney Bldg., Detroit 26 |
| New York | Sept. 30-Oct. 1<br>Oct. 4-7 | New York<br>Buffalo | David W. Beier | 23 S. Pearl St., Albany 7 |
| Rhode Island | Dec. 6-7 | Providence | F. M. Hackett | State Office Bldg., Divn. Professional Regulation, Providence |

## OTHER MEETINGS

| Name | Date | City | Secy. or Chmn. | Address |
|---|---|---|---|---|
| American Academy of Pedodontics | Oct. 14-15 | San Francisco | E. C. Schildwachter Secy. | 6831 Seville Ave., Huntington Park, Calif. |
| American Academy of Periodontology, Annual Meeting | Oct. 13-15 | San Francisco | C. E. Chamberlain Secy. | 115 North St., Peoria |
| American Association of Dental Examiners | Oct. 15-16 | San Francisco | C. A. Bumstead Secy. | 924 Stuart Bldg., Lincoln, Neb. |
| American Association of Public Health Dentists, Annual Meeting | Oct. 16 | San Francisco | C. L. Sebelius Secy. | Tennessee Dept. of Public Health, Nashville 3, Tenn. |
| American College of Dentists | Oct. 16 | San Francisco | O. W. Brandhorst Secy. | 4952 Maryland Ave., St. Louis 8 |
| American Dental Assistants Association, Silver Anniversary | Oct. 17-20* | San Francisco | Mary L. Martin | 610 Jefferson Ave., La Porte, Ind. |
| American Dental Association, Ninetieth Annual Meeting | Oct. 17-20 | San Francisco | H. Hillenbrand Secy. | 222 E. Superior St., Chicago 11 |
| American Dental Hygienists' Association, Twenty-Sixth Annual Meeting | Oct. 17-21 | San Francisco | A. Rebekah Fisk Secy. | 1830 Eye St., N. W., Washington, D. C. |
| American Dental Laboratories Association, Second Annual Meeting | Nov. 18-20 | Cleveland | Ken Gall Chm. Program Committee | 560 Rose Bldg., Cleveland 15 |
| American Dental Society of Europe | Aug. 3-6 | Paris | F. D. Derrick Secy. | 140 Park Lane, London, W. 1 |
| American Public Health Association, Seventy-Seventh Annual Meeting | Oct. 23 | New York | R. M. Atwater Secy. | 1790 Broadway New York 19 |
| American Society for the Advancement of General Anesthesia in Dentistry, Fall Meeting | Oct. 24 | New York | M. H. Feldman Exec. Secy. | 730 Fifth Ave., New York |
| American Society of Oral Surgeons, Thirty-First Annual Meeting | Oct. 12-15 | San Francisco | Harry Bear Secy. | 1112 E. Clay St., Richmond 19 |
| Association of American Women Dentists | Oct. 17 | San Francisco | Dora T. Smith Secy. | Cheda Bldg., San Anselmo, Calif. |
| Greater New York Dental Meeting, Twenty-Fifth Anniversary | Dec. 5-9 | New York | H. S. Horton Chm. Press & Publication | Rm. 106A, Hotel Statler, New York 1 |
| Maryland State Dental Association, Semi-Annual Meeting | Sept. 25-27 | Hagerstown | E. L. Pessagno, Jr. Secy. | Medical Arts Bldg., Baltimore 1 |
| Midcontinent Dental Congress, Ninth Annual Meeting | Nov. 27-30 | St. Louis | J. E. Brophy Secy. | Syndicate Trust Bldg., St. Louis |
| National Board of Dental Examiners | Dec. 5-6† | | G. L. Teall Secy. | Box 71, Hiawatha, Kan. |
| New England Dental Society, Annual Meeting | Oct. 5-6 | Boston | A. R. Wilson Secy. | 43 Farmington Ave., Hartford |

*Examination for certification
†Examinations (Part I and Part II) will be held in schools where there are five or more candidates